



Guidance Document

The Monitoring and Reporting Regulation – General guidance for Aircraft Operators

MRR Guidance document No. 2

Updated Version, 31 January 2022

This document is part of a series of documents provided by the Commission services for supporting the implementation of the “MRR” (the “Monitoring and Reporting Regulation”) for the EU ETS (the European greenhouse gas Emission Trading System). A new version of the MRR has been developed for the use in the 4th phase of the EU ETS, i.e. Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 in its current version¹.

The guidance represents the views of the Commission services at the time of publication. It is not legally binding.

This guidance document takes into account the discussions within meetings of the informal Technical Working Group on MRVA (Monitoring, Reporting, Verification and Accreditation) under the WG III of the Climate Change Committee (CCC), as well as written comments received from stakeholders and experts from Member States. This guidance document was unanimously endorsed by the representatives of the Member States of the Climate Change Committee by written procedure ending on 23 December 2021.

All guidance documents and templates can be downloaded from the documentation section of the Commission’s website at the following address:

https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en .

¹ Updated by Commission Implementing Regulation (EU) 2020/2085 of 14 December 2020 amending and correcting Implementing Regulation (EU) 2018/2066 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council; the consolidated MRR can be found here: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02018R2066-20210101>

Version History

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16 July 2012	Published	Endorsed by CCC on 11 July 2012
11 January 2018	Published	Main changes: <ul style="list-style-type: none"> ● taking into account Regulation (EU) 2017/2392; ● Inclusion of biomass topics from GD3, making this document a standalone document for aviation activities in the EU ETS; ● Improvement of the biomass guidance; ● Alignment with other existing guidance, various minor improvements.
31 January 2022	Published	Adjustment to revised MRR; Guidance on CORSIA, Brexit and Swiss linking
		Another update of this document is planned regarding an update on the treatment of biofuels following the relevant RED II guidance once it is available.

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1 SUMMARY

Monitoring and reporting of emissions is a cornerstone of the EU ETS² (the Union Emissions Trading System). Following the revisions of the EU ETS Directive in 2009 and 2018, updated rules for monitoring and reporting have been laid down in the form of an EU Regulation (the Monitoring and Reporting Regulation, hereinafter the “MRR”). At the same time, a Regulation for verification of emissions and accreditation of verifiers (the “AVR”) was established. In 2018, both Regulations were revised and re-published. A further revision took place in 2020. This guidance document builds on these revised 2020 Regulations.

This guidance document is part of a series of guidance documents and electronic templates provided by the Commission services to support the EU-wide harmonised implementation of the MRR. It gives an introduction to the EU ETS compliance system, the concepts used for monitoring and reporting of emissions and tonne-kilometre data of aircraft operators, and then describes in more detail the requirements laid down in the MRR for the possible monitoring approaches. This guidance does not add to the mandatory requirements of the MRR, but it is aimed at assisting in more correct interpretation and facilitated implementation.

This guidance document represents the views of the Commission services at the time of publication. It is not legally binding.

Note that this document does not cover requirements for stationary installations. Operators of installations in search of guidance on monitoring and reporting in the EU ETS are invited to consult guidance document No. 1.



1.1 Where should I start reading?

This document has been developed to guide readers who are new to the EU ETS as well as those who are already familiar with the EU ETS. The latter group should in particular pay attention to sections which are marked with a *New!* sign throughout the document (for a list of guiding symbols see section 2.2). Section 1.2 of this summary will serve as useful starting point.

Readers with little experience of the EU ETS and its MRV (Monitoring, Reporting and Verification) system should read in particular chapter 4 (about the EU ETS compliance cycle) and chapter 5 (concepts and approaches). All readers who need to monitor aviation activities and therefore who have to develop (or update) a monitoring plan, are advised to check chapter 6 on monitoring plans.

Aircraft operators who qualify as “small emitters” (for definition see section 5.6.1) should look for the “small” icon.



² For an explanation of acronyms and for references of legislative texts please see the annex of this document.

1.2 What is new for Aircraft Operators?

New!

The M&R Regulation was developed for harmonisation of the MRV requirements across all Member States³ applying the EU Emission Trading System. The MRR was revised for phase 4 of the EU ETS (starting on 1 January 2021) taking into account extensive discussions with Member States, gathering their experience during phase 3. The revision included also some elements relevant for CORSIA-related monitoring and reporting.

Besides changes in the MRR, amendments to the EU ETS Directive also had to be taken into account for updating this guidance document. This includes in particular the scope changes due to the Linking agreement with the Swiss ETS. Readers who want to focus in particular on new elements of this guidance should especially note the following changes:

- The implementation of an MRV system for the purpose of CORSIA (ICAO's global market-based measure) from 2021 through an implemented act⁴. Aircraft operators have to monitor and report all international flights as explained in section 3.1.5.
- The Linking Agreement with the Swiss ETS – see section 3.1.3;
- The clarification of the scope regarding flights from and to the UK following Brexit (see section 3.1.4);
- New eligibility thresholds for aircraft operators to apply simplified MRV approaches – see section 5.6 (e.g. aircraft operators with emissions lower than 3 000 tonnes of CO₂ per year from intra-EEA flights).
- Non-commercial aircraft operators emitting less than 1 000 tonnes of CO₂ per year are exempted from the EU ETS and therefore from reporting their emissions until 2030; For details see section 3.2.2.
- The determination of the density of fuels has been simplified – section 5.4.5;
- Tiers have been abandoned for the monitoring of most parameters. The tier system is now only applicable to t-km data – section 5.3;
-
- The MRR uses the same definitions for biomass and biofuels as the Directive on Renewable Energy Sources (RES-D). Consequently, the sustainability criteria established by the RES-D must be applied where relevant in order to apply an emission factor of zero to such biomass. This topic – previously covered in detail in a separate guidance document (see section 2.3 for where to find other guidance documents) – has now been included in Annex I (section 7.1) to make this document more complete for aircraft operators.
- From 2022, the MRR aligns the requirements on biomass and biofuel monitoring with the requirements of the revised RES-D, the so-called RED II⁵. At the time of writing this current update of this guidance document, relevant implementing and delegated acts under the RED II are under development.

³ In this guidance document, "Member States" means the current 27 EU Member States as well as the EFTA countries Norway, Iceland and Liechtenstein.

⁴ Commission Delegated Regulation (EU) 2019/1603 of 18 July 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council as regards measures adopted by the International Civil Aviation Organisation for the monitoring, reporting and verification of aviation emissions for the purpose of implementing a global market-based measure.

⁵ Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast).

Consequently it is envisaged to provide another update of this document once the relevant acts have been published.

Note: Some Article numbers have changed between the “old” (2012/601) and “new” (2018/2066) MRR. The correlation table below (taken from Annex XI of the new MRR) applies.

Commission Regulation (EU) No 601/2012	Commission Implementing Regulation (EU) 2018/2066
Article 1 to 49	Article 1 to 49
-	Article 50
Article 50 to 67	Article 51 to 68
Article 68	-
Article 69 to 75	Article 69 to 75
-	Article 76
Article 76 to 77	Article 77 to 78
Annex I to X	Annex I to X
-	Annex XI

2 INTRODUCTION

2.1 About this document

This document has been written to support the M&R Regulation, by explaining its requirements in a non-legislative language. For some more specific technical issues, further guidance documents are available. The set of guidance documents is further complemented by electronic templates⁶ for information to be submitted by aircraft operators to the competent authority. However, it should always be remembered that the Regulation is the primary requirement.

This document interprets the Regulation regarding requirements for aircraft operators. It builds on earlier guidance as well as best practice identified during earlier phases of the EU ETS. It also takes into account the valuable input from the task force on monitoring established under the EU ETS Compliance Forum, and from the informal Technical Working Group (TWG on MRVA) of Member State experts established under Working Group 3 (WG III) of the Climate Change Committee.

2.2 How to use this document

Where article numbers are given in this document without further specification, they always refer to the most recent M&R Regulation⁷. For acronyms, references to legislative texts and links to further important documents, please see the Annex.

New!

This document only refers to emissions starting from 2021. The “New” symbol marks new elements that were introduced since the last version of this guidance or which specifically apply only from 2021 onwards.



This symbol points to important hints for aircraft operators and competent authorities.

Simplified!

This indicator is used where significant simplifications to the general requirements of the MRR are promoted.



The light bulb symbol is used where best practices are presented.



The small emitter symbol is used to guide the reader to topics which are applicable for aircraft operators classified as “small emitters”.



The tools symbol tells the reader that other documents, templates or electronic tools are available from other sources.



The book symbol points to examples given for the topics discussed in the surrounding text.

⁶ Note that Member States may define their own templates, which must contain at least the same information as the Commission’s templates.

⁷ Commission Implementing Regulation (EU) 2018/2066 taking into account amendments by Commission Implementing Regulation (EU) 2020/2085.

2.3 Where to find further information

All guidance documents and templates provided by the Commission on the basis of the M&R Regulation and the A&V Regulation can be downloaded from the Commission's website at the following address:

https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en



The following documents are provided⁸ (documents not relevant for aircraft operators are given in grey):

- “Quick guides” as introduction to the guidance documents below. Separate documents are available for each audience:
 - Operators of stationary installations;
 - Aircraft operators;
 - Competent Authorities;
 - Verifiers;
 - National Accreditation Bodies.
- Guidance document No. 1: “The Monitoring and Reporting Regulation – General guidance for installations”.
 - An exemplar simplified monitoring plan in accordance with Article 13 MRR.
- Guidance document No. 2 (this document): “The Monitoring and Reporting Regulation – General guidance for aircraft operators”. This document outlines the principles and monitoring approaches of the MRR relevant for the aviation sector. It also includes guidance on the treatment of biomass in the aviation sector, making it a stand-alone guidance document for aircraft operators.
- Guidance document No. 3: “Biomass issues in the EU ETS”: This document discusses the application of sustainability criteria for biomass, as well as the requirements of Articles 38 and 39 of the MRR. This document is relevant for operators of installations and useful as background information for aircraft operators.
- Guidance document No. 4: “Guidance on Uncertainty Assessment”. This document for installations gives information on assessing the uncertainty associated with the measurement equipment used, and thus helps the operator to determine whether he can comply with specific tier requirements.
 - Guidance document No. 4a: “Exemplar Uncertainty Assessment”. This document contains further guidance and provides examples for carrying out uncertainty assessments and how to demonstrate compliance with tier requirements.
- Guidance document No. 5: “Guidance on sampling and analysis” (only for installations). This document deals with the criteria for the use of non-accredited

⁸ This list reflects the status at the time of writing this updated guidance. Further documents may be added later.

laboratories, development of a sampling plan, and various other related issues concerning the monitoring of emissions in the EU ETS.

- Guidance document No. 5a: “Exemplar Sampling Plan”. This document provides an example sampling plan for a stationary installation.
- Guidance document No. 6: “Data flow activities and control system”. This document discusses possibilities to describe data flow activities for monitoring in the EU ETS, the risk assessment as part of the control system, and examples of control activities.
 - Guidance document No. 6a: “Risk Assessment and control activities – examples”. This document gives further guidance and an example for a risk assessment.
- Guidance document No. 7: “Continuous Emissions Monitoring Systems (CEMS)”. This document gives information on the application of measurement-based approaches where GHG emissions are measured directly in the stack, and thus helps the operator to determine which type of equipment has to be used and whether he can comply with specific tier requirements.
- Guidance document No. 8: “EU ETS Inspection”: Targeted at competent authorities, this document outlines the role of the CA’s inspections for strengthening the MRVA system of the EU ETS.

The Commission furthermore provides the following electronic templates:

- Template No. 1: Monitoring plan for the emissions of stationary installations
- Template No. 2: Monitoring plan for the emissions of aircraft operators
- Template No. 3: Monitoring plan for the tonne-kilometre data of aircraft operators
- Template No. 4: Annual emissions report of stationary installations
- Template No. 5: Annual emissions report of aircraft operators
- Template No. 6: Tonne-kilometre data report of aircraft operators
- Template No. 7: Improvement report of stationary installations
- Template No. 8: Improvement report of aircraft operators

There are furthermore the following tools available for operators:

- Unreasonable costs determination tool;
- Tool for the assessment of uncertainties;
- Frequency of Analysis Tool;
- Tool for operator risk assessment.

The following MRR Training material is available for operators:

- Roadmap through M&R Guidance
- Uncertainty assessment
- Unreasonable costs
- Sampling plans
- Data gaps
- Round Robin Test

Besides these documents dedicated to the MRR, a separate set of guidance documents on the A&V Regulation is available under the same address. Furthermore, the Commission has provided guidance on the scope of the EU ETS for aircraft operators:



<http://data.europa.eu/eli/dec/2009/450/oj>

A huge amount of information for aircraft operators is also found on DG CLIMA's website dedicated to the EU ETS for aviation (Especially under the tabs "Documentation" and "FAQ"⁹):

https://ec.europa.eu/clima/eu-action/transport-emissions/reducing-emissions-aviation_en

All EU legislation is found on EUR-Lex: <http://eur-lex.europa.eu/>

The most important legislation is furthermore listed in the Annex of this document.

Also competent authorities in the Member States may provide useful guidance on their own websites. Aircraft operators should in particular check if the competent authority provides workshops, FAQs, helpdesks etc.



⁹ With regard to FAQ, it is always advisable to check the date of publication in case it has been superseded by more recent guidance/developments.

3 AVIATION IN THE EU ETS – PRINCIPLES

3.1 Scope of included aviation activities

Due to the international character of aviation activities, an aircraft operator has to be aware not only of the EU ETS, but of several systems for GHG emission reduction which exist in parallel and which may have a different scope regarding monitoring and reporting obligations. Therefore, the following sections explain the “full scope” and “reduced scope” of the EU ETS, the scope of flights under the Swiss Linking Agreement, and the scope of flights falling under CORSIA. The new UK ETS is mentioned as well.

The basic monitoring and reporting approaches in these systems are quite similar. When an aircraft operator is included in any of these systems, it must ensure that it is able in a reliable manner to identify for all flights carried out whether they are falling under one or more of these systems. This is achieved in principle by including appropriate procedures in the monitoring plan for tracking the aircraft in the fleet (including various leasing options), for monitoring the fuel consumption, and for assigning correctly for each flight whether it is included in one or more GHG emission reduction systems, taking into account the relevant exemptions of flight types. Relevant “GHG emission reduction systems” at this time include the EU ETS, CORSIA, the Swiss ETS and UK ETS.

Figure 1 in section 3.4 gives an overview of how an aircraft operator can determine if it is included in the EU ETS, and whether it is entitled to use simplified methods for Monitoring, Reporting and Verification (MRV).

Note on terminology:



For determining the scope of the EU ETS and for whether simplified monitoring approaches are applicable, there are several thresholds applicable. This guidance document uses the following terminology:

- **De-minimis threshold:** If below this threshold, the aircraft operator is excluded from the EU ETS. The following apply in accordance with Annex I of the EU ETS Directive (see also section 3.2.2; here the “extended full scope” applies):
 - For commercial aircraft operators: *either 10 000 t CO₂/yr (extended full scope) or 243 flights per period for three consecutive four-month periods.*
 - For non-commercial aircraft operators: *1 000 t CO₂/yr.* This threshold applies only until 31 December 2030.
- **Small emitter threshold:** Determines, whether simplified monitoring approaches are allowed. There are two different small emitter thresholds:
 - Article 55 of the MRR uses a threshold of *either 25 000 t CO₂/yr (full scope) or 243 flights per period for three consecutive four-month periods.* Details are given in section 5.6.
 - Article 28a(6) of the EU ETS Directive uses *25 000 t CO₂/yr full scope, or 3 000 t CO₂/yr reduced scope.* See details in section 5.9.

3.1.1 “Full scope” EU ETS aviation activities

Annex I of the EU ETS Directive defines the scope of aviation activities included in the EU ETS. The Directive requires that *all flights are covered which depart from or arrive in an aerodrome situated in the territory of a Member State to which the Treaty applies* (including outermost regions, dependencies and territories of that Member State)¹⁰. Due to the extension of the EEA agreement¹¹, “Member State” must be read as “EEA State” (i.e. the current 27 EU Member States plus the EFTA states Norway, Iceland and Liechtenstein). Furthermore, from 1 January 2020, flights from Switzerland to EEA aerodromes are covered by the Swiss ETS based on the Swiss linking agreement¹². These flights are therefore excluded from the “full scope” of the EU ETS (however, they are *not* excluded from the “extended full scope” for determining the de-minimis thresholds, see section 3.2.2). The same applies from 1 January 2021 to flights from the UK to EEA aerodromes, based on the Trade and Cooperation Agreement between the European Union, as the UK ETS covers these flights¹³.



Flights from Switzerland and UK to the EEA are also excluded from the *reduced scope*. However, this is the case based on the fact that they are no EEA countries and needs no further explanation.

Aircraft operators who perform such aviation activities are to participate in the emissions trading system, regardless of whether they are based in the EU or EFTA countries or where their operating license has been issued.

Note that under the current legislation (until 31 December 2023) this “(extended) full scope” is required only for determining if an aircraft operator is included in the EU ETS and whether it is considered a “small emitter”¹⁴. For monitoring and reporting of emissions and for surrendering allowances, the “reduced scope” (section 3.1.2) applies.



For criteria if an aircraft operator is exempted as a whole from the EU ETS, please see section 3.2.2.

Annex I of the EU ETS Directive also lists several **exemptions** from the scope of the EU ETS. Exempted are:



- Flights performed by aircraft with a certified maximum take-off mass of less than 5 700 kg. That means in particular that aircraft operators who do not use heavier aircraft are not included in the EU ETS.
- The following types of flights are excluded from the EU ETS:

¹⁰ The following overseas territories belong to the “territory to which the Treaty applies”: the five French overseas departments (Guadeloupe, French Guyana, Martinique, Réunion, Mayotte); the French overseas communities of Saint-Martin; the Spanish Autonomous Community of the Canary Islands; and the Portuguese autonomous regions of the Azores and Madeira; Furthermore the territories Ceuta and Melilla (Spain), Aland Islands (Finland) and Jan Mayen (Norway) belong to the EEA and are therefore covered by the EU ETS.

¹¹ See Annex for legislative reference.

¹² EU ETS Directive Annex I as amended by Commission Delegated Decision (EU) 2020/1071

¹³ EU ETS Directive Annex I as amended by Commission Delegated Decision (EU) 2021/1416

¹⁴ Note, however, that for the determination of the de-minimis thresholds, flights from UK and Switzerland are to be added to the full scope.

- Flights on official mission, of a reigning Monarch and his immediate family, of Heads of State, Heads of Government and Government Ministers, of a country other than a Member State;
- Military flights performed by military aircraft;
- Flights related to search and rescue, fire fighting flights, humanitarian flights and medical service flights;
- Flights performed exclusively under visual flight rules;
- Circular flights (departing and arriving at the same airport without an intermediate stop);
- Training flights;
- Flights performed exclusively for the purpose of scientific research;
- Flights performed in the framework of public service obligations.

For more details on these exemptions see the Commission's guidance¹⁵ on the interpretation of aviation activities listed in Annex I of the EU ETS Directive. That guidance gives information on the use of CRCO exemption codes¹⁶ for identifying these exemptions using flight plans.



In short, the phrase “all flights covered by Annex I of the EU ETS Directive, i.e. all flights landing in or departing from an EEA aerodrome, taking into account the above exceptions, minus flights from Switzerland or the UK” defines the “full scope” of the EU ETS.

3.1.2 “Reduced scope” of the EU ETS

From 2013, the “full scope” was temporarily replaced by the “reporting scope/reduced scope” due to the development and implementation of the ICAO's global market-based measure in the form of the “Carbon Offsetting and Reduction Scheme for International Aviation” (CORSIA). The EU ETS Directive was amended by Regulation (EU) 421/2014 and Regulation (EU) 2392/2017 which introduced the following exceptions from the full scope:

- Flights from and to non-EEA aerodromes are exempted from the reporting and surrendering obligations of the EU ETS¹⁷.
- Exempted are all emissions from flights between an aerodrome located in an outermost region within the meaning of Article 349 of the Treaty on the Functioning of the European Union and an aerodrome located in another region of the EEA but outside the outermost region of arrival or departure. The EU currently includes nine outermost regions: Canary Island, French Guiana, Guadeloupe, Martinique, Mayotte, Réunion, Saint-Martin, Azores and Madeira. Emissions from flights between aerodromes in the same outermost region remain fully covered by the EU ETS.

¹⁵ Commission Decision 2009/450/EC of 8 June 2009 on the detailed interpretation of the aviation activities listed in Annex I to Directive 2003/87/EC of the European Parliament and of the Council, 2009/450/EC.

¹⁶ Codes used by Eurocontrol's Central Route Charges Office (CRCO) for identification of route charges exemption.

¹⁷ Flights to and from overseas territories of Member States which are not part of the EEA are consequently also excluded. Such overseas territories are: DK: Greenland, Faeroe Islands; FR: French Polynesia, New Caledonia, Saint Barthélemy, Saint Pierre and Miquelon, Wallis and Futuna; NL: Aruba, Bonaire, Saba, Sint Eustatius, Curaçao, Sint Maarten; NO: Svalbard.

The reduced scope is applicable until 31 December 2023. Thereafter, the full scope will be re-established, unless new provisions enter into force following a new amendment of the EU ETS Directive.

Note: There are exemptions from the above-mentioned exemption. From 1 January 2020, **flights departing from EEA aerodromes to Switzerland** are covered by the EU ETS based on the Swiss linking agreement. From 1 January 2021, the Trade and Cooperation Agreement between the European Union and the UK clarifies that **flights from EEA countries to the UK**¹⁸ remain covered by the EU ETS. **These flights are included in the “reduced scope”.**



For symmetry reasons, flights from Switzerland to EEA aerodromes are covered by the Swiss ETS¹⁹ and so are Swiss domestic flights. Similarly, the UK ETS covers flights departing from the UK to EEA countries as well as UK domestic flights²⁰.

3.1.3 Change of EU ETS scope change due to the linking with the CH ETS

New!

An agreement between the European Union and the Swiss Confederation on the linking of their greenhouse gas emissions trading systems was reached at the end of 2017 and has entered into force on 1 January 2020. As a consequence, the EU ETS Directive was amended²¹: Flights from the EEA to Switzerland (e.g. Lisbon – Zurich) are included in the EU ETS. Flights from Switzerland to the EEA (e.g. Zurich – Lisbon) and domestic flights in Switzerland (e.g. Zurich – Bern) are included in the Swiss ETS (CH ETS). Note that this change applies to both, the full and the reduced scope of the EU ETS, as mentioned in sections 3.1.1 and 3.1.2. However, flights from Swiss to EEA aerodromes are still to be taken into account when determining the de-minimis thresholds.

3.1.4 Change of EU ETS scope change due to Brexit

A Trade and Cooperation Agreement²² was concluded between the European Union and the United Kingdom in December 2020. The Agreement entered into force on 1 May 2021 but is applicable from 1 January 2021. As a consequence,

¹⁸ The Trade and Cooperation Agreement applies to the metropolitan territory of the United Kingdom. This means that the overseas countries and territories are in principle not covered. In particular, the Crown dependencies, i.e. Bailiwick of Guernsey, Bailiwick of Jersey and Isle of Man as regards to the EU ETS are not covered. Similarly the Agreement does not apply to Gibraltar nor has any effects on its territory. This does not exclude the possibility to have in the future a separate agreement between the EU and the UK in relation to Gibraltar. Therefore, flights from EEA aerodromes to those destinations should currently not be included in the EU ETS.

¹⁹ For basic information on the Swiss ETS for aircraft operators please see <https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/reduction-measures/ets/aviation.html>

²⁰ Guidance on the UK ETS is available from the UK's authorities: <https://www.gov.uk/government/publications/participating-in-the-uk-ets/participating-in-the-uk-ets>

²¹ Commission Delegated Decision (EU) 2020/1071 of 18 May 2020 amending Directive 2003/87/EC of the European Parliament and of the Council, as regards the exclusion of incoming flights from Switzerland from the EU emissions trading system

²² Council Decision (EU) 2021/689 of 29 April 2021 on the conclusion, on behalf of the Union, of the Trade and Cooperation Agreement between the European Union and the European Atomic Energy Community, of the one part, and the United Kingdom of Great Britain and Northern Ireland, of the other part, and of the Agreement between the European Union and the United Kingdom of Great Britain and Northern Ireland concerning security procedures for exchanging and protecting classified information (OJ L 149, 30.04.2021, p.2).

the EU ETS Directive has been amended appropriately by a delegated act²³. Flights from the EEA to the UK (e.g. Lisbon – London) are included in the EU ETS. Flights from the UK to the EEA (e.g. London – Lisbon) and domestic flights in the UK (e.g. London – Manchester) are included in the UK ETS. Note that this change applies to both, the full and the reduced scope of the EU ETS, as mentioned in sections 3.1.1 and 3.1.2. However, flights from UK to EEA aerodromes are still to be taken into account when determining the de-minimis thresholds.

New!

3.1.5 Scope of CORSIA

Since 1 January 2019, aircraft operators which exceed the respective thresholds of 10 000 t CO₂ for international flights need to report all international flights for purposes of calculating the baseline of CORSIA²⁴. The EU agreed to implement CORSIA (and in particular the relevant MRV system) through the EU ETS. “International flights” are flights between aerodromes in different states participating in CORSIA. Only “domestic flights” (flights within one ICAO member state, e.g. Los Angeles – New York) are excluded from CORSIA.

Aircraft operators who have obligations for CORSIA in an EEA State (see section 3.3.3) have to monitor all international flights to fulfil the CORSIA requirements at the same time as their EU ETS requirements. CORSIA covers:

- Flights under the reduced scope of the EU ETS with the exception of domestic flights;
- Flights included in the “full scope” of the EU ETS:
 - Flights between aerodromes located in Member States and aerodromes located in third countries;
 - Flights between aerodromes located in Member States and aerodromes located in outermost regions, dependencies or territories of other Member States;
 - Flights between aerodromes located in outermost regions, dependencies or territories of Member States and aerodromes located in third countries or dependencies or territories of other Member States;
- Flights between aerodromes located in two different third countries.

Several categories of flights are excluded from CORSIA, such as State flights, humanitarian flights, medical flights, military flights and firefighting flights. Those exemptions are similar, but not 100% identical to the exemptions from the EU ETS.

²³ Commission Delegated Regulation (EU) 2021/1416 of 17 June 2021 amending Directive 2003/87/EC of the European Parliament and of the Council as regards the exclusion of incoming flights from the United Kingdom from the Union emissions trading system, http://data.europa.eu/eli/reg_del/2021/1416/oj

²⁴ Commission Delegated Regulation (EU) 2019/1603 of 18 July 2019 supplementing Directive 2003/87/EC

3.2 Aircraft operators

3.2.1 Identification and attribution of flights

According to the EU ETS Directive (Article 3(o)), an aircraft operator is “*the person who operates an aircraft at the time it performs an aviation activity listed in Annex I [of the EU ETS Directive] or, where that person is not known or is not identified by the owner of the aircraft, the owner of the aircraft*”. For the purpose of monitoring and reporting, a unique identification for the aircraft operator is necessary. Article 51(3) of the M&R Regulation defines that those unique aircraft operators are defined by the call sign used for Air Traffic Control (ATC). In general, this is the unique ICAO designator in box 7 of the flight plan (three letter code, which excludes the flight identifier). When the unique ICAO designator is not available, the aircraft operator will be identified by the registration marking of the aircraft, which should then be used as a call sign for ATC purposes in the flight plan. Usually the registration marking will concern the owner of the aircraft.



Note: Wherever this guidance uses the term “ICAO designator” it should be read as above, including the aircraft registration markings entered in box 7 of the flight plan if the ICAO designator is not available.

The use of the ICAO designator does not necessarily imply that an aircraft operator is commercially or operationally responsible for a particular flight. This depends in most cases on the type of commercial arrangements between carriers in the aviation sector. Whether code sharing, dry leasing or wet leasing, long or short term leasing is applied by an aircraft operator has no bearing on identifying the aircraft operator.

A daughter company does not have to carry out its own monitoring and reporting (i.e. submit a monitoring plan and annual emission reports) if all flights of the daughter company are performed under the unique ICAO designator of the parent company or another daughter company. The parent or sister company will in that case be the aircraft operator for flights performed by the daughter company and all flights will have to be covered in the monitoring plan and reports of the parent or sister company. An aircraft operator having two Air Operator Certificates but only having one unique ICAO designator should submit one monitoring plan. In case of doubt, Eurocontrol data on payment of route charges will be a useful tool to check assignment of the unique ICAO designator in box 7 of the flight plan to individual aircraft operators within the meaning in the EU ETS.

3.2.2 Excluded Aircraft operators

The following aircraft operators have no obligations under the EU ETS (they are “excluded” from the EU ETS):



- *Commercial air transport operators*²⁵ operating either:

²⁵ Article 3(p) of the EU ETS Directive defines: ‘*commercial air transport operator*’ means an operator that, for remuneration, provides scheduled or non-scheduled air transport services to the public for the carriage of passengers, freight or mail.

- fewer than 243 flights per period for three consecutive four-month periods, or
- flights with total annual emissions lower than 10 000 tonnes CO₂ per year.

For applying those “de-minimis thresholds”, a **special (extended) version of the “full scope of the EU ETS”** has to be used: The flights from Switzerland or the UK to an EEA aerodrome have to be added to the full scope²⁶.

Where the thresholds of this “*de-minimis* rule” are exceeded, all flights of that aircraft operator (if not excluded due to the other exemptions) during the whole calendar year are included in the EU ETS.

Clarifications: Aircraft operators who do not have an air operator’s certificate²⁷ (AOC) are non-commercial operators. The four-month periods are: January to April; May to August; September to December. The local time of departure of the flight determines in which four-month period that flight shall be taken into account for deciding whether the aircraft operator falls above or below the exemption thresholds of the de-minimis rule.

Further clarifications are given in the Commission’s guidance on the interpretation of aviation activities listed in Annex I of the EU ETS Directive¹⁵.

New!

- Until 31 December 2030, *non-commercial aircraft operators* with total annual emissions lower than 1 000 tonnes per year²⁸ are exempted from the EU ETS. The threshold has to be evaluated on an annual basis. The “extended” full scope is relevant for determination whether the de-minimis threshold is exceeded, as explained in the previous bullet point.
- *Other exemptions:* As flights performed by aircraft with a certified maximum take-off mass of less than 5 700 kg are excluded, it is clear that aircraft operators who do not use heavier aircraft are not included in the EU ETS.



3.2.3 Aircraft operators eligible for simplified MRV

Certain (usually small) aircraft operators are eligible for simplified monitoring, reporting and verification procedures. These are further discussed in section 5.6. Relevant “small emitter thresholds” are:

- Emissions of less than 25 000 t CO₂ per year²⁹ applying the full scope (see 3.1.1); or
- Emissions of less than 3 000 t CO₂ per year under reduced scope (these may still be large emitters if considering the full scope).

²⁶ This is due to the special wording of Annex I of the EU ETS Directive, which on the one hand excludes flights from Switzerland or UK from Annex I, but states that for the purpose of calculating the de-minimis threshold, these flights are *not* excluded.

²⁷ Outside the EU other terms for such certificates may be in use.

²⁸ This provision was introduced by Commission Delegated Decision (EU) 2020/1071 of 18 May 2020 amending Directive 2003/87/EC of the European Parliament and of the Council, as regards the exclusion of incoming flights from Switzerland from the EU emissions trading system

²⁹ Note that Article 28a(6) of the EU ETS Directive does not include the threshold of less than 243 flights in each of 3 consecutive 4-months periods.

3.3 Administering Member States

3.3.1 Administering MS for the EU ETS

In the EU ETS, both EU (and EEA) and non-EU aircraft operators are included. In order to ensure an efficient implementation of the EU ETS Directive, each aircraft operator is assigned to one and only one administering Member State (Article 18a of the Directive):



- In the case of an aircraft operator with a valid operating licence granted by a Member State in accordance with the provisions of Council Regulation (EEC) No 2407/92, the Member State which granted the operating licence;
- In all other cases, the Member State with the greatest estimated attributed aviation emissions from flights performed by that aircraft operator in the base year. Those estimated attributed emissions are calculated by Eurocontrol.

The European Commission has to publish a list (or updates thereof) of aircraft operators and their assigned administering Member States each year before 1 February.

From 1 January 2021, the UK has ceased to participate in the EU ETS. **Aircraft operators which were previously administered by the UK authorities and perform aviation activities under the EU ETS are assigned to other EEA States from 2021.**

New!

The latest version of that list (in the form of a Commission Regulation) can be found on the Commission's website³⁰. That list contains for each aircraft operator identified by Eurocontrol:

- Its "unique identifier" (identical to the CRCO Identification Number used for invoicing route charges);
- The name of the aircraft operator;
- The aircraft operator's state of origin; and
- The administering EEA state.

The unique identifier is also very important for identifying the aircraft operator's monitoring plans and emission reports and (if applicable) tonne-kilometre reports.

For aircraft operators who start operation of aviation activities which fall under the EU ETS, but are not yet contained in the above-mentioned list, the Commission regularly updates a "prior compliance list", which gives an indication of the most likely administering Member State well before the next regular operator list is published. The prior compliance list can be found under

https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en.

Furthermore Eurocontrol and the Commission are interested in improving the data quality of those lists. In particular aircraft which may belong (sometimes) to a specific aircraft operator but are also operated outside that aircraft operator's business, or which are (sometimes, but not always) managed by service companies, should be notified to Eurocontrol using the "fleet list form". For further instructions please see the link given above.

³⁰ https://ec.europa.eu/clima/policies/ets/monitoring/operators_en#tab-0-1



Knowing the administering Member State is important for aircraft operators, because the national law of the administering Member State applies. Note that the general legal framework of the EU ETS is the same in all Member States, based on the EU ETS Directive. However, there may be some differences in some details such as deadlines or administrative fines applied. The M&R Regulation and A&V Regulation are directly applicable in all Member States.

The administering Member State also assigns the competent authority in line with its national legislation. Any reference to “competent authority” made in this document should be read as the appropriately designated authority or authorities in the aircraft operator’s assigned administering Member State.

3.3.2 One-stop-shop for Swiss Linking

As can be seen in section 3.1.3 on “Swiss Linking”, an operator flying to and from Switzerland will have both flights covered by the EU ETS and the Swiss ETS. In order to reduce administrative burden, the linking agreement introduces the concept of a single point of contact (a “one-stop-shop”) for the administration of both the EU ETS and the CH ETS. It is either Switzerland or a Member State, never both.

Aircraft operators that are not exempted in the EU ETS must also report their CH ETS scope emissions.

3.3.3 Competent authority for CORSIA

Aircraft operators may have a different Competent Authority for CORSIA than for EU ETS. For the purpose of CORSIA, the attribution of an aircraft operator to a State shall be determined by its unique ICAO designator (ICAO Designator and Notifying State are contained in Doc 8385) or by the Air Operator Certificate in case of non-availability of ICAO Designator (aircraft operator is attributed to the issuing State) or by the place of the juridical registration (in case that the aircraft operator possesses neither an ICAO designator nor an AOC, the State where the aeroplane is registered as juridical person shall be the State where the operator has to fulfil his obligations).

ICAO published and regularly updates a list of Aeroplane Operators and the State to which they have been attributed. This document can be downloaded on the ICAO CORSIA webpage³¹.

For those aircraft operators that have an AOC or operating license from an EU Member State or EEA State, the administration of EU ETS and CORSIA is performed by the same competent authority (and also the MP and AER are combined in joint templates for both purposes). Foreign operators are reporting for CORSIA purposes to their home country’s authorities.

³¹ <https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx> in section “CORSIA Central Registry (CCR)”

3.4 Decision tree for inclusion of aircraft operators

Under current legislation an aircraft operator who needs to decide on his status in the EU ETS/CORSIA should follow the following step-by-step instructions as shown in Figure 1 (red numbers in the Figure correspond with the steps outlined below).

Note that this is not a one-time exercise, but needs to be repeated every year if the aircraft operator operates near to the thresholds given.



Obligation under the EU ETS:

1. The Aircraft Operator (AO) has to determine its fleet used **in the year under examination**. This includes also temporarily or permanently leased aircraft (see also section 3.2.1). Aircraft with a certified maximum take-off mass of less than 5 700 kg are removed from that list.
2. The AO determines a list of all flights. Depending on whether the inclusion in the EU ETS or CORSIA is assessed, the list of flights has to be “filtered” accordingly, applying either the scope of the EU ETS or the CORSIA scope. Keep in mind that different exemption rules apply for these scopes. For the purpose of the EU ETS, both extended full and reduced scope are required for the decision tree.
3. The AO has to conclude whether it is a “commercial air transport operator” (see footnote 25).
4. Using this list of flights, the AO has to determine the emissions related to the flights covered by the EU ETS, based on the *extended full scope* of the EU ETS. If the AO is a commercial air transport operator and the list of flights includes fewer flights than the threshold under point 5a, the determination of emissions may be omitted. Non-commercial AOs continue with point 6.
5. Commercial air transport operators should answer the following questions:
 - a. Is the number of (extended full scope) flights below 243 flights in each of the three periods January to April, May to August and September to December?
 - b. Is the amount of (extended full scope) emissions below 10 000 t CO₂ per year?If at least one of the answers is “yes”, the AO is not covered by the EU ETS (i.e. he has no further obligation under the EU ETS Directive). All other commercial AOs continue with point 7.
6. Non-commercial aircraft operators should check if their emissions (“extended” full scope) are below 1 000 t CO₂ per year. If this is the case, they are excluded from the EU ETS. Checking step 6 is applicable until 31 December 2030.
7. All AOs which have come to this point are included in the EU ETS (and CH ETS) and consequently have to follow the applicable rules on MRV as outlined in the following chapters of this guidance document. However, they may wish to use simplified requirements. If this is the case, the AOs should perform the following steps.
8. If the AO performs (under the full scope of the EU ETS) less than 243 flights in each of the three periods January to April, May to August and September to December, or his emissions are lower than 25 000 t CO₂ per year, the AO

is considered a “small emitter” and may consequently be approved to apply the simplified approaches discussed in section 5.6.

9. If the AO is considered an aircraft operator with low emissions because it emits less than 25 000 t CO₂ per year, and chooses to create his annual emission report fully by using Eurocontrol’s “Small Emitter Tool” (SET) populated by Eurocontrol with data from the ETS Support Facility (ETS-SF), the AO is allowed to submit that emission report without verification. Further details on this approach are given in section 5.9.
10. Finally, if the AO emits less than 3 000 t CO₂ per year applying the “reduced scope”, and the AO chooses to create his annual emission report fully by using Eurocontrol’s “Small Emitter Tool” (SET) populated by Eurocontrol with data from the ETS Support Facility (ETS-SF), the AO is allowed to submit that emission report without verification, as under the previous point.

New!

Obligations under CORSIA

For determination of an obligation under CORSIA, only steps 1 and 2 above need to be performed. Thereafter: An aircraft operator with emissions below 10 000 t CO₂ per year from international flights is not covered by CORSIA (i.e. he has no further obligation under the EU ETS Directive for CORSIA purposes). All other AOs consequently have to follow the applicable rules on MRV.

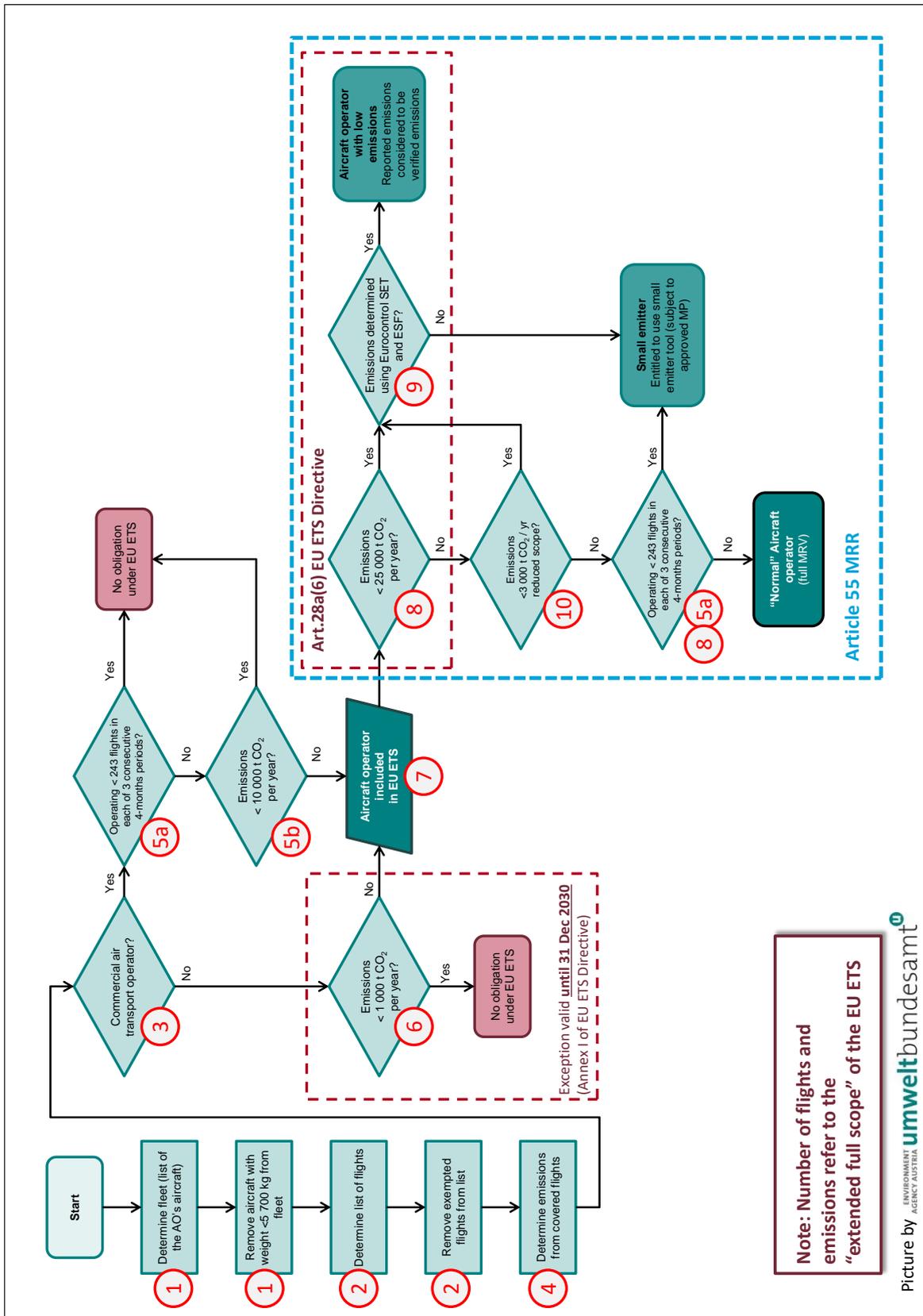


Figure 1: Decision tree for determining if an aircraft operator is included in the EU ETS, and if so, if simplified MRV approaches are allowed. For further explanation please refer to the main text.

3.5 Relevance of tonne-kilometre data

Each aircraft operator has to monitor his annual emissions from activities falling under the EU ETS. However, the MRR and this guidance document also discuss the voluntary monitoring of “tonne-kilometre” data (also referred to as “t-km” data). Only when the aircraft operator applies for free allocation of allowances, does a verified t-km data report have to be attached.

Tonne-kilometre data have to be monitored for the relevant “monitoring years” only. These are:

- The year 2010 for free allocation for the years 2012 to 2023 (applications filed in 2011; see Article 3e(1) of the EU ETS Directive);
- For applications from the “special reserve”³² (Article 3f of the EU ETS Directive): The second year of the trading period has to be monitored if an aircraft operator wants to file an application for allocation from the special reserve. These was applicable in 2014.
- Due to Regulation³³ (EU) 2017/2392 for preparing for ICAO’s global market based measure, no further submissions of t-km data are currently planned. However, a new amendment of the EU ETS Directive may require the submission of t-km data in the future again.

Despite the voluntary nature of t-km data reporting, it must be mentioned that according to Article 3g of the EU ETS Directive, every aircraft operator is obliged to have an approved monitoring plan not only for emissions, but also for tonne-kilometre data.

The Commission calculated a benchmark (allowances per t-km) after having received all relevant t-km data from the Member States, for allowing the Member States to calculate the allocation to aircraft operators.

For more details on the application for free allowances, please contact your competent authority.

³² Such applications may be filed by aircraft operators who

- (a) start performing an aviation activity falling within Annex I after the monitoring year for which tonne-kilometre data was submitted for “normal” allocation; or
- (b) whose tonne-kilometre data increases by an average of more than 18 % annually between the monitoring year for which tonne-kilometre data was submitted and the second calendar year of that trading period;

and whose activity under point (a), or additional activity under point (b), is not in whole or in part a continuation of an aviation activity previously performed by another aircraft operator.

The Commission may provide further guidance on the detailed rules on the operation of the special reserve (Article 3f of the EU ETS Directive).

³³ Regulation (EU) 2017/2392 of the European Parliament and of the Council of 13 December 2017 amending Directive 2003/87/EC to continue current limitations of scope for aviation activities and to prepare to implement a global market-based measure from 2021

Download: <http://data.europa.eu/eli/reg/2017/2392/oj>

4 THE EU ETS COMPLIANCE CYCLE

4.1 Importance of MRV in the EU ETS

Monitoring, reporting and verification (MRV) of emissions play a key role in the credibility of any emission trading system. Without MRV, compliance would lack transparency and be much more difficult to track, and enforcement compromised. This holds true also for the Union Emission Trading System (EU ETS). It is the complete, consistent, accurate and transparent monitoring, reporting and verification system that creates trust in emissions trading. Only in this way can it be ensured that operators and aircraft operators meet their obligation to surrender sufficient allowances.

This observation is based on the twofold nature of the EU ETS: On the one hand it is a market based instrument. It has allowed a significant market to evolve, in which market participants want to know the monetary value of the allowances they get allocated, they trade and they have to surrender. On the other hand it is an instrument for achieving an environmental benefit. But in contrast to other environmental legislation, the goal is not to be achieved by individuals, but the whole group of EU ETS participants having to achieve the goal jointly. This requires a considerable level of fairness between participants, ensured by a solid MRV system. The competent authorities' oversight activities contribute significantly to ensuring that the goal set by the cap is reached, meaning that the anticipated emission reductions are delivered in practice. It is therefore the responsibility of the competent authorities together with the accreditation bodies to protect the integrity of the EU ETS by supervising the well-functioning of the MRV system.

Both, carbon market participants and competent authorities want to have assurance that one tonne CO₂ equivalent emitted finds its equivalent of one tonne reported (for the purpose of one allowance to be surrendered). This principle has become known already from the early days of the EU ETS as the proverbial postulation: **“A tonne must be a tonne!”**



In order to ensure that this is achieved in a robust, transparent, verifiable and yet cost effective way, the EU ETS Directive³⁴ provides a solid basis for a good monitoring, reporting and verification system. This is achieved by Articles 14 and 15 in connection with Annexes IV and V of the EU ETS Directive. Based on Article 14, the Commission has provided the “M&R Regulation³⁵” (MRR), which has been amended several times since the introduction from 1 January 2013.

However, it has always been recognised by the Commission as well as by Member States that a complex and technical legislation such as the MRR needs to be supported by further guidance, in order to ensure harmonised implementation throughout all Member States, and for paving the way to smooth compliance through pragmatic approaches wherever possible.

³⁴ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC including all amendments.

³⁵ Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive- 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012.

Furthermore a Regulation for verification and accreditation of verifiers has been provided (the “A&V Regulation”³⁶, also revised for the 4th phase of the EU ETS), for which a separate series of guidance documents has been developed by the Commission.

4.2 Overview of the compliance cycle

The annual process of monitoring, reporting, verification of emissions, surrender of allowances, and the competent authority’s procedure for accepting emission reports are often referred to as the “compliance cycle”. Figure 2 shows the main elements of this cycle.

On the right side of the picture there is the “main cycle”: The aircraft operator monitors the emissions throughout the year. After the end of the calendar year (within three months³⁷) he must prepare the annual emissions report (AER), seek verification and submit the verified report to the competent authority (CA). The verified emissions must correlate with the surrender of allowances in the Registry system³⁸. Here the principle “a tonne must be a tonne” translates into “a tonne must be an allowance”, i.e. at this point the market value of the allowance is correlated with the costs of meeting the environmental goal of the EU ETS. Thereafter the monitoring goes on, as shown in the picture. More precisely, the monitoring continues without any stop at the end of the year.

The monitoring process needs a firm basis. Resulting data must be sufficiently robust for creating trust in the reliability of the ETS, including the fairness of the surrender obligation, and it must be consistent throughout the years. Therefore the aircraft operator must ensure that the monitoring methodology is documented in writing, and cannot be changed arbitrarily. In the case of the EU ETS, this written methodology is called the Monitoring Plan (MP) of the aircraft operator (see Figure 2). It is a requirement for aircraft operators under Article 3g of the EU ETS Directive.

The figure also shows that the monitoring plan, although very specific for an individual aircraft operator, must follow the requirements of the EU-wide applicable legislation, in particular the Monitoring and Reporting Regulation. As a result, the MRV system of the EU ETS is able to square the circle between strict EU-wide rules providing reliability and preventing arbitrary and undue simplifications, and allowing for sufficient flexibility for the circumstances of individual aircraft operators.

³⁶ Commission Implementing Regulation (EU) 2018/2067 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council

³⁷ According to national legislation, this period may be shorter, see footnote 43.

³⁸ For the purpose of simplification, the surrender of allowances has not been included in the picture. Similarly, the picture also ignores the processes of allocation and trading of allowances.

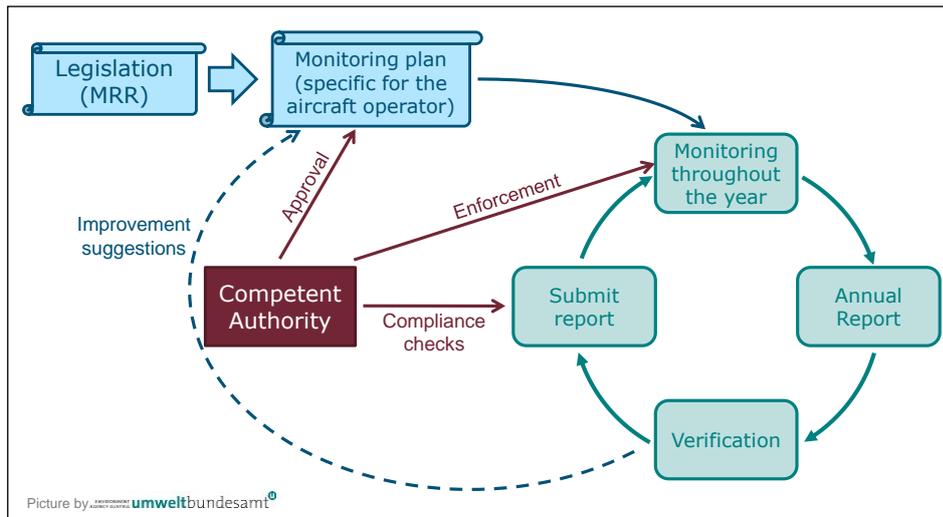


Figure 2: Principle of the EU ETS compliance cycle (only main elements of the MRR shown).

Figure 2 also shows some key responsibilities of the competent authority. It has to supervise the compliance of aircraft operators. As the first step, the CA has to approve every monitoring plan before it is applied. This means that the monitoring plans developed by the aircraft operator are checked for compliance with the MRR's requirements. Where the aircraft operator makes use of simplified approaches allowed by the MRR, this must be justified by the aircraft operator, for example, based on the threshold limits set by the EU ETS Directive.

It is furthermore the responsibility of the competent authority to carry out checks on the annual emission reports, as appropriate. This includes spot checks on the already verified reports, but also cross-checks with figures entered in the verified emissions table of the registry system, and checking that sufficient allowances have been surrendered.



However, the compliance cycle has a wider perspective. As Figure 2 shows, there is a second cycle. This is the regular review of the monitoring plan, for which the verification report may provide valuable input. Besides, the aircraft operator is required to continuously strive for further improving the monitoring methodology.

4.3 The importance of the monitoring plan

From the previous section it becomes apparent, that the approved monitoring plan is the most important document for every aircraft operator participating in the EU ETS. Like a recipe for a cook and like the management handbook for a certified quality management system, it serves as manual for the aircraft operator's tasks. Therefore it should be written in a way that allows all, particularly new staff to immediately follow the instructions. It must also allow the CA to understand quickly the aircraft operator's monitoring activities. Finally, the MP is *the* guide for the verifier against which the aircraft operator's emission report is to be judged.

Typical elements of a monitoring plan include the following activities of the aircraft operator (applicability depends on the specific circumstances):

- Data collection (metering data, invoices, flight logs,...);
- Description of calculations and formulae to be used;
- Control activities (e.g. four eyes principle for data collection);
- Data archiving (including protection against manipulation);
- Regular identification of improvement possibilities.

However, monitoring plans must be drafted carefully (see chapter 6), so that administrative burden is minimised. Since the MP is to be approved by the competent authority, it goes without saying that changes of the MP are only allowed with the consent of the CA. The M&R Regulation reduces the administrative efforts here by allowing two approaches which should already be taken into account when drafting monitoring plans:

Simplified!

- Only changes which are "significant" need the approval by the CA (Article 15 of the MRR, see section 6.5 below);
- Monitoring activities which are not crucial in every detail, and which by their nature tend to be frequently amended as found necessary, may be put into "written procedures", which are mentioned and described briefly in the MP, but the detail of which are not considered part of the approved MP. The relationship between monitoring plan and written procedures is described in more detail in section 6.2.



Because of the importance of the monitoring plan, the Commission is also providing templates for monitoring plans. Some Member States might have provided customized templates based on the Commission's templates, other Member States use a dedicated (usually web-based) electronic reporting system (that must also meet at least stated Commission requirements). Before developing a monitoring plan, aircraft operators are therefore advised to check their competent authority's website or make direct contact with the CA for finding out the concrete requirements for submitting a monitoring plan. National legislation of the administering Member State may also state specific requirements.

New!

NOTE: The Commission has provided a monitoring template which can be used simultaneously for the EU ETS and CORSIA (if applicable) to minimise administrative burden³⁹. Since the main difference between EU ETS, Swiss ETS, UK ETS and CORSIA regarding the monitoring aspects lies in the different scopes (which flights are to be covered), there is in principle no obstacle against using the same

³⁹ Download from https://ec.europa.eu/clima/policies/ets/monitoring_en#tab-0-1

monitoring plan for all these systems, provided that appropriate procedures are added for identifying under which of these systems each flight has to be reported.

4.4 Milestones and deadlines

4.4.1 The annual compliance cycle

The EU ETS compliance cycle is built around the requirement that monitoring is always related to the calendar year⁴⁰, as shown in Table 1 and Figure 3.

The monitoring plan should be approved by the competent authority before the start of the first year for which emissions are to be reported (i.e. the first year of the trading period, such as 2013). However, for new aircraft operators, Article 52 of the MRR requires the monitoring plans to be submitted to the competent authority at the latest four months before he commences aviation activities covered by the EU ETS.

In practice this is often difficult to achieve (sometimes aircraft operators do not know very far in advance that they will operate flights to destinations in the EEA). Furthermore some aircraft operators will not know early enough which Member State will be their administering MS (see section 3.3.1). Therefore, Article 52 allows the following derogations:



- An aircraft operator that performs an aviation activity covered by the EU ETS for the first time that could not be foreseen four months in advance, shall submit a monitoring plan to the competent authority *without undue delay, but no later than six weeks after performance of that activity*. A justification must be attached.
- Where the administering Member State is not known in advance, the aircraft operator shall without undue delay submit the monitoring plan when information on the competent authority of the administering Member State becomes available (i.e. when the aircraft operator appears on the “prior compliance list”, he should contact that Member States’ competent authority, and at the latest when the regular aircraft operator list is published by the Commission, see section 3.3.1)

Aircraft operators have three months⁴¹ after the end of the year to finalise the emission reports and to get them verified by an accredited verifier in accordance with the A&V Regulation. Thereafter aircraft operators have to surrender the corresponding amount of allowances. Subject to national legislation, the competent authority of the administering MS may or shall perform (spot) checks on the reports received, and must determine a conservative estimate of the emissions, if the aircraft operator fails to submit an emissions report, or where a report has been submitted, but it is either not compliant with the MRR or not (positively) verified in accordance with the A&V Regulation (Article 70(1) of the MRR). When the CA detects any kind of errors in the submitted reports, corrections to the verified emissions figure may be a result. Note that for such corrections no deadline

⁴⁰ Article 3(12) of the MRR defines: ‘reporting period’ means one calendar year during which emissions have to be monitored and reported [...].

⁴¹ According to national legislation, this period may be shorter, see footnote 43.

is given by EU legislation. However, there may be some requirement given in national legislation.

Table 1: Common timeline of the annual EU ETS compliance cycle for emissions in year N.



When?	Who?	What?
1 January N		Start of monitoring period
By 28 February N	CA	Allocation of allowances for free (if applicable) on the aircraft operator's account in the Registry
31 December N		End of monitoring period
Before 1 February N+1	European Commission	Update and publish a list of aircraft operators specifying the administering Member State for each aircraft operator
by 31 March ⁴² N+1	Verifier	Finish verification and issue verification report to operator
By 31 March ⁴³ N+1	Aircraft operator	Submit <i>verified</i> annual emissions report
By 31 March N+1	Aircraft operator / Verifier ⁴⁴	Enter verified emissions figure in the verified emissions table of the Registry
March – April N+1	CA	Subject to national legislation, possible spot checks of submitted annual emissions reports. Require corrections by aircraft operator, if applicable. N.B. Subject to national legislation, there is no obligation for CAs to provide assistance or acceptance of aircraft operator reports either before or after 30 April).
By 30 April N+1	Aircraft operator	Surrender allowances (amount corresponding to verified annual emissions) in Registry system
By 30 June N+1	Aircraft operator	Submit report on possible improvements of the MP, if applicable ⁴⁵
(No specified deadline)	CA	Carry out further checks on submitted annual emissions reports, where considered necessary or as may be required by national legislation; require changes of the emissions data and surrender of additional allowances, if applicable (in accordance with administering Member State legislation).

Figure 3 also suggests indicative timings for the verification process. Experience has shown that the availability of verifiers may be a bottleneck in some Member States, especially if the whole verification process is performed in the first three months of the year. However, several parts of the verification process can be performed well before the end of the reporting year. Therefore the advice to the aircraft operator is to contract a verifier early in the reporting year, ideally soon

⁴² Footnote 43 applies here as well.

⁴³ According to Article 68(1) competent authorities may require operators or aircraft operators to submit the verified annual emission report earlier than by 31 March, but by 28 February at the earliest.

⁴⁴ This may be regulated differently in the Member States.

⁴⁵ For aircraft operators only the improvement reports in accordance with Article 69(4) of the MRR are relevant, i.e. the ones to be submitted in the year where a verifier reports improvement recommendations. The CA may set a different deadline, but no later than 30 September of that year.

after the previous report has been submitted in March. The verifier is then able to plan and perform much of the required work throughout the rest of the year, leaving only the final checks and the issuing of the verification report for the first quarter of the following year.

Finally, it has to be mentioned that further requirements apply which are not listed here. In particular, as discussed in section 6.5, the aircraft operator has to update the monitoring plan throughout the year where relevant, and the competent authority has to assess and approve it where relevant.

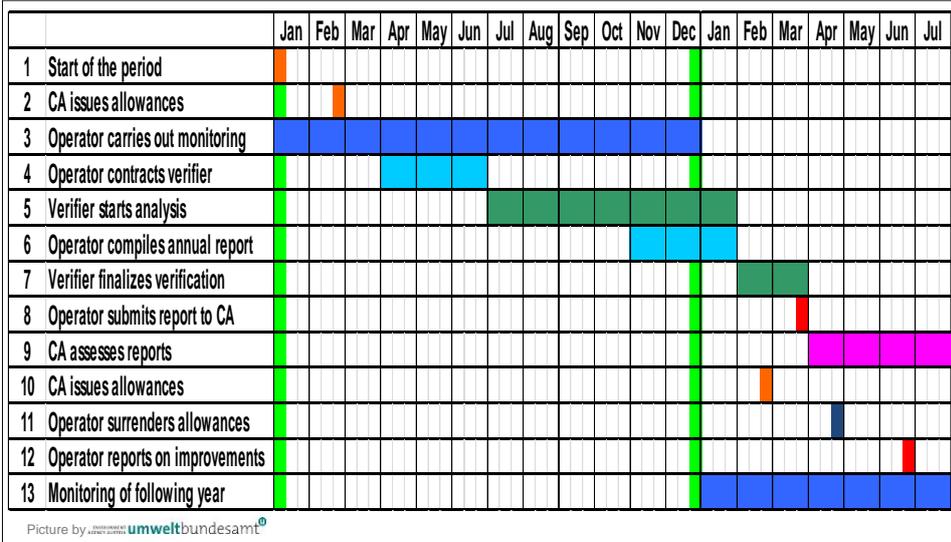


Figure 3: Example timeline for the EU ETS compliance cycle. “Operator” should be read as “aircraft operator”.

4.4.2 Approval of the monitoring plan

In order to make the compliance cycle work, the monitoring plans of all aircraft operators needed to be approved by the competent authority before the start of the monitoring period. For new participants in the EU ETS (or CORSIA, if relevant), the MP must be approved before the start of operations, or without undue delay after receiving certainty about the administering Member State (see section 4.4.1).

For the start of a new trading phase, some Member States may require that the monitoring plans of all aircraft operators be revised and adapted to the new requirements. Based on experience from previous ETS phases, such a general revision process may require several months and should be well prepared. For the purpose of providing additional guidance, a (legally non-binding) timeline is presented here. Relatively long timescales are assumed, as required for the most complex aircraft operators, as follows: Firstly, preparation of the monitoring plan by the aircraft operators can take up to several months, depending on the complexity of their operations. However, for simple aircraft operators, the monitoring plan may be compiled within a few working days.

Because the CA also need a few weeks or months for assessing all submitted MPs (depending on current workload) and because aircraft operators then need

some weeks for finally implementing the new approved MP, aircraft operators should prepare the new monitoring plans early enough for submission of MPs by the middle of the year, but at the latest by end of September⁴⁶. An example timeline for the start of a new trading period is shown in Table 2.

Table 2: Model timeline for preparing the EU ETS compliance cycle for the start of a new trading period. Note that deadlines may significantly differ according to the Member States. Y is the year in which the new trading period starts (e.g. Y=2013 for the third trading period).

When?	Who?	What?
May – Sept. Y-1	Aircraft Operator	Check existing MP for required updates, or develop new MP, as applicable
July – Sept. Y-1	CA	Suggested deadline for receiving new or updated MP from operators
July – Dec. Y-1	CA	Check and approve MPs
Oct. – Dec. Y-1	Aircraft operator	Prepare for implementation of approved MP
1 January Y		Start of monitoring period using the new MRR requirements

4.5 Roles and responsibilities

The different responsibilities of the aircraft operators, verifiers and competent authorities are shown in Figure 4, taking into account the activities mentioned in the previous sections. For the purpose of completeness, also the accreditation body is included. The picture clearly shows the high level of control which is efficiently built into the MRV system. The monitoring and reporting is the main responsibility of the aircraft operators (who are also responsible for hiring the verifier and for providing all relevant information to the verifier). The CA approves the monitoring plans, receives and checks the emission reports and may make corrections to the verified emissions figure where errors are detected. Thus, the CA is in control over the final result. Finally, the verifier is ultimately answerable to the accreditation body⁴⁷. Note that based on Article 66 of the A&V Regulation, Member States must also monitor the performance of their national accreditation bodies, thereby fully ensuring the integrity of the EU ETS system of MRV and accreditation.

⁴⁶ Note that the concrete deadlines set by competent authorities in the Member States may differ from this assumption.

⁴⁷ The A&V Regulation also allows in exceptional cases verifiers (if natural persons) to be certified and supervised by a national authority appointed by that Member State (in accordance with AVR Article 55).

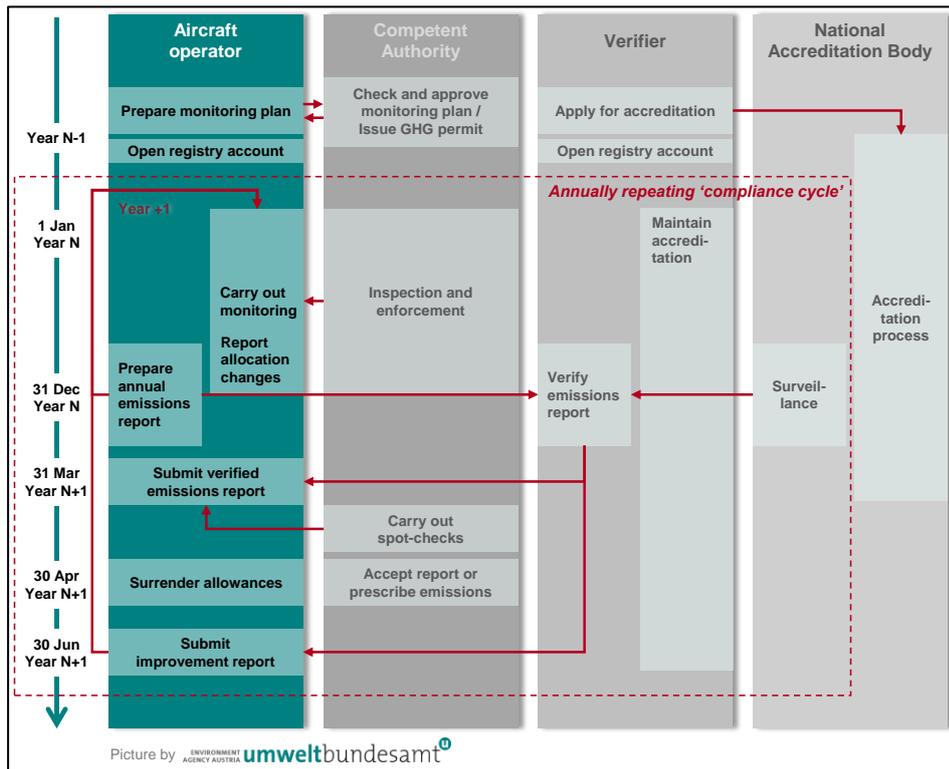


Figure 4: Overview of responsibilities of the main actors in the EU ETS. Regarding "Accreditation body" see also footnote 47.

5 CONCEPTS AND APPROACHES

This chapter is dedicated to explaining the most important terms and concepts needed for developing a monitoring plan.

5.1 Underlying principles

Articles 5 to 9 of the MRR outline the guiding principles which the aircraft operators have to follow when fulfilling their obligations. These are:

- **Completeness** (Article 5): The completeness of emission sources and source streams is at the very core of the EU ETS monitoring principles. This is why the aircraft operator has to implement a procedure for keeping track of his fleet, i.e. all aircraft carrying out activities covered by the EU ETS, including leased-in aircraft, in order to ensure completeness of the emissions monitored.
- **Consistency and comparability** (Article 6(1)): Time series⁴⁸ of data need to be consistent throughout the years. Arbitrary changes of monitoring methodologies are prohibited. This is why the monitoring plan has to be approved by the competent authority, such as also significant changes to the MP.
- **Transparency** (Article 6(2)): All data collection, compilation and calculation must be made in a transparent way. This means that the data itself, the methods for obtaining and using them (in other words: the whole data flow) have to be documented transparently, and all relevant information has to be securely stored and retained allowing for sufficient access by authorised third parties. In particular, the verifier and the competent authority must be allowed access to this information.

It is worth mentioning that transparency is in the own interest of the aircraft operator: It facilitates transfer of responsibilities between existing and new staff and reduces the likelihood of errors and omissions. In turn this reduces the risk of over-surrendering, or under-surrendering and penalties. Without transparency, the verification activities are more onerous and time-consuming.

Furthermore Article 67 of the MRR specifies that relevant data is to be stored for 10 years. The minimum data to be retained is listed in Annex IX of the MRR.

- **Accuracy** (Article (7)): Aircraft operators have to take care that data is accurate, i.e. neither systematically nor knowingly inaccurate. Due diligence is required by aircraft operators, striving for the highest achievable accuracy. As the next point shows, “highest achievable” may be read as where it is technically feasible and “without incurring unreasonable costs”.
- **Integrity of the methodology and of the emissions report** (Article 8): This principle is at the very heart of any MRV system. The MRR mentions it explicitly and adds some elements that are needed for good monitoring:

⁴⁸ This does not imply a requirement to produce time series of data, but assumes that the aircraft operator, verifier or competent authority may use time series as a means of consistency checks.

- The monitoring methodology and the data management must allow the verifier to achieve “reasonable assurance⁴⁹” on the emissions report, i.e. the monitoring must be able to endure a quite intensive test;
- Data shall be free from material⁵⁰ misstatements and avoid bias;
- The data shall provide a credible and balanced account of an aircraft operator’s emissions.
- When looking for greater accuracy, aircraft operators may balance the benefit against additional costs. They shall aim for “highest achievable accuracy, unless this is technically not feasible or would lead to unreasonable costs”.
- **Continuous improvement** (Article 9): In addition to the requirement of Article 69, which requires the aircraft operator to submit reports on improvement possibilities if appropriate, this principle also is the foundation for the operator’s duty of responding to the verifier’s recommendations (see also Figure 2 on page 27).

5.2 Source streams and emission sources

The MRR uses some terms for appropriately covering some concepts which apply to installations as well as aircraft operators. For aircraft operators the following two terms might need some interpretation:

- **Emission source:** The M&R Regulation defines (Article 3(5)): “‘emission source’ means a separately identifiable part of an installation or a process within an installation, from which relevant greenhouse gases are emitted or, for aviation activities, an individual aircraft”. For ensuring the completeness of monitoring, the aircraft operator must ensure that he always tracks the completeness of his emission sources, i.e. the fleet of aircraft currently operating, including leased-in aircraft.
- **Source streams⁵¹:** From aircraft operator’s view this term simply concerns “fuel”. Where an aircraft operator only uses one type of fuel, as is typically the case at the present time, he has only one source stream. However, different types of fuel constitute different source streams.

5.3 The tier system

The EU ETS system for monitoring and reporting provides for a building block system of monitoring methodologies. Each parameter needed for the determination of emissions can be determined by different “data quality levels”. These “data

⁴⁹ Article 3(19) of the A&V Regulation defines: “‘reasonable assurance’ means a high but not absolute level of assurance, expressed positively in the verification opinion, as to whether the operator’s or aircraft operator’s report subject to verification is free from material misstatement.” For more details on the definition this term, see guidance documents on the A&V guidance, in particular the AVR Explanatory Guidance (EGD I). Section 2.3 provides a link to those documents.

⁵⁰ See footnote 49.

⁵¹ MRR Article 3(4): ‘source stream’ means any of the following:

- (a) a specific fuel type, raw material or product giving rise to emissions of relevant greenhouse gases at one or more emission sources as a result of its consumption or production;
- (b) a specific fuel type, raw material or product containing carbon and included in the calculation of greenhouse gas emissions using a mass-balance methodology”

quality levels” are called “tiers”⁵². In general it can be said that a tier with a lower number represents a method with lower requirements and less accurate than a higher tier.

New!

For aircraft operators, the revision of the MRR in 2018 simplified the monitoring in a way that no higher tiers are to be selected. Only for one case a selection from tiers is still possible which is regarding the mass of passengers (as part of the payload required regarding t-km data).

5.4 Monitoring approaches for emissions

5.4.1 General approach

Aircraft operators determine CO₂ emissions using a simplified version of the standard methodology for combustion emissions⁵³, using the following formula:



$$Em = AD \cdot EF \quad (1)$$

Where:

Em Emissions [t CO₂]

AD..... Activity data (=amount of fuel consumed) [t]

EF Emission factor [t CO₂/t fuel]

Note that unlike installations, aircraft operators always report the activity data as tonnes of fuel, not based on the calorific value. However, for consistency reasons, the Net Calorific Value (NCV) of the fuel has to be reported as a memo-item.

This calculation is to be carried out in principle for each individual flight. For reporting purposes, all fuel consumptions of the same type of fuel can be summed up. However, for the annual emissions report an aggregation of emissions per aerodrome pair and per country of departure and arrival is also to be prepared. Aircraft operators should ensure that their electronic data processing systems are capable of ensuring those aggregations.

5.4.2 Definition of a ‘flight’

The guidelines in Commission Decision 2009/450/EC define: “*The term ‘flight’ means one flight sector that is a flight or one of a series of flights which commences at a parking place of the aircraft and terminates at a parking place of the aircraft.*” In simpler wording, this means “from one block-off to the next block-off” (Method A), or “from one block-on to the next block-on” (Method B).



Note that the fuel consumption of the auxiliary power unit (if any) is included consistently in both monitoring methods (see section 5.4.3). For avoiding data gaps or double counting, it is important to use consistently for each aircraft only either Method A or Method B.

For attributing a flight to a specific reporting year, the local time of departure should be used. For example, if a flight departs in Toronto at 22.00pm local time

⁵² Article 3(8) of the MRR defines: ‘*tier*’ means a set requirement used for determining activity data, calculation factors, annual emission and annual average hourly emission, and payload.

⁵³ For more information see guidance document No. 1 (general guidance for installations).

on 31 December 2016 and lands in Amsterdam at 11.30am local time on 1 January 2017, the flight should be listed in the 2016 emissions report and tonne-km report.

5.4.3 Amount of fuel consumed

The M&R Regulation allows two different approaches (Method A and Method B, see section 1 of Annex III of the MRR) for determining fuel consumption of a flight which is covered by the EU ETS (flight N):

Method A⁵⁴: The operator shall use the following formula:

$$F_{N,A} = T_N - T_{N+1} + U_{N+1} \quad (2)$$

Where:

$F_{N,A}$ Fuel consumed for the flight under consideration (=flight N) determined using method A [t]

T_N Amount of fuel contained in aircraft tanks once fuel uplift for the flight under consideration (=flight N) is complete [t]

T_{N+1} Amount of fuel contained in aircraft tanks once fuel uplift for the subsequent flight (=flight N+1) is complete [t]

U_{N+1} Fuel uplift for the subsequent flight (=flight N+1) [t]

Method B⁵⁵: The operator shall use the following formula:

$$F_{N,B} = R_{N-1} - R_N + U_N \quad (3)$$

Where:

$F_{N,B}$ Fuel consumed for the flight under consideration (=flight N) determined using method B [t]

R_{N-1} Amount of fuel remaining in aircraft tanks at the end of the previous flight (=flight N-1), i.e. at block-on before the flight under consideration, expressed in [t]

R_N Amount of fuel remaining in aircraft tanks at the end of the flight under consideration (=flight N), i.e. at block-on after the flight, expressed in [t]

U_N Fuel uplift for the flight considered, expressed in [t]

⁵⁴ Section 1 of Annex III of the MRR: "Actual fuel consumption for each flight [t] = Amount of fuel contained in aircraft tanks once fuel uplift for the flight is complete [t] – Amount of fuel contained in aircraft tanks once fuel uplift for subsequent flight is complete [t] + Fuel uplift for that subsequent flight [t]"

⁵⁵ Section 1 of Annex III of the MRR: "Actual fuel consumption for each flight [t] = Amount of fuel remaining in aircraft tanks at block-on at the end of the previous flight [t] + Fuel uplift for the flight [t] - Amount of fuel contained in tanks at block-on at the end of the flight [t]"



For ensuring completeness of the data, it is important to note that not only data generated during the duty of the one flight's crew is needed, but also data generated from the subsequent flight (Method A) or the previous flight (Method B). This is in particular important when a non-ETS flight is followed by an ETS flight, or vice versa. For avoiding data gaps it is therefore recommended that (depending on the Method applied), the amount of fuel remaining in the tank after the flight or the amount of fuel in the tank after fuel uplift is *always* recorded on flights of aircraft which are used for EU ETS flights. For the same reasons, fuel uplift data for *all* flights of those aircraft should be collected, before deciding which flights are covered by the EU ETS (see section 3.13.1)

Treatment of special situations:

Method A: Where no fuel uplift for the flight or subsequent flight takes place, the amount of fuel contained in aircraft tanks (T_N or T_{N+1}) shall be determined at block-off for the flight or subsequent flight.

In exceptional cases the variable T_{N+1} cannot be determined. This is the case when an aircraft performs activities other than a flight, including undergoing major maintenance involving the emptying of the tanks, after the flight to be monitored. In such case the aircraft operator may substitute the quantity " $T_{N+1} + U_{n+1}$ " with the 'Amount of fuel remaining in tanks at the start of the subsequent activity⁵⁶ of the aircraft', as recorded by technical logs.

Method B: For simplification, the moment of block-on may be considered equivalent to the moment of engine shut down.

Where an aircraft does not perform a flight previous to the flight for which fuel consumption is being monitored (e.g. if the flight follows a major revision or maintenance), the aircraft operator may substitute the quantity R_{N-1} with the 'Amount of fuel remaining in aircraft tanks at the end of the previous activity of the aircraft', as recorded by technical logs.

5.4.4 Comparing Method A and B

The difference between Method A and B can best be explained by the following example highlighted in the figure below which shows that Method A has different end and starting points for the monitoring of the fuel consumption compared to Method B.

Figure 5 shows the changes of the fuel level in the aircraft tank and highlights which measurements have to be taken for calculating fuel consumption with Method A or B. Measurements "A" are taken after the fuel uplift. Measurements "B" are taken on block-on at the end of the previous flight or engine shut down.

⁵⁶ This is the activity which is not a flight.

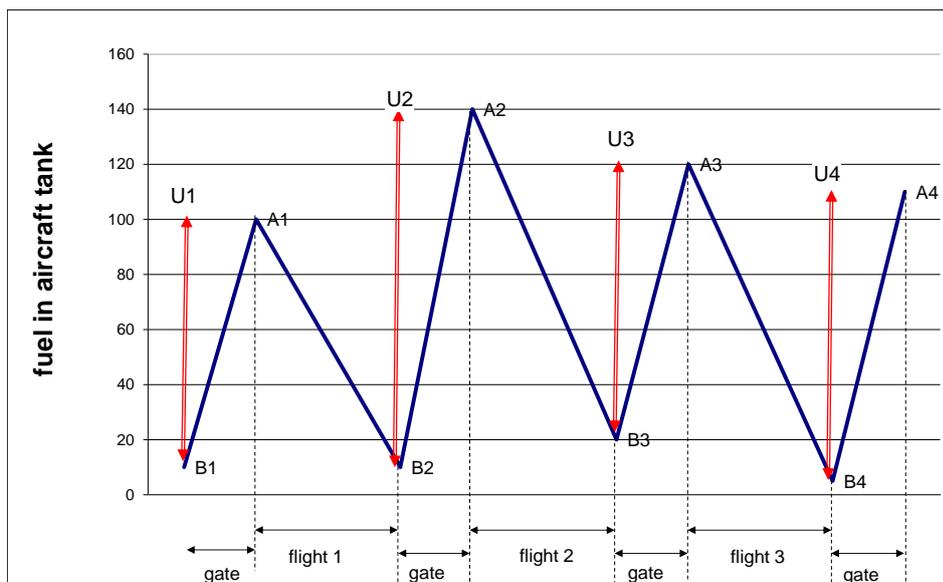


Figure 5: Illustration of the two monitoring methods for fuel consumption of aircraft operators. For explanation please see the main text. (Picture by PriceWaterhouseCoopers⁵⁷)

In this example the fuel consumption according to Method A and according to Method B respectively would be calculated in the following manner:

	Method A	Method B
Fuel consumption flight 1	$A1 - A2 + U2$	$B1 + U1 - B2$
Fuel consumption flight 2	$A2 - A3 + U3$	$B2 + U2 - B3$
Fuel consumption flight 3	$A3 - A4 + U4$	$B3 + U3 - B4$

In both methods subsequent EU ETS flights are monitored without time gap between the flights. When monitoring the fuel consumption of a flight, the data from the previous flight and the subsequent flight have to be available and taken into account, even if non-EU ETS activities are concerned.

5.4.5 Density

If the amount of fuel uplift or the amount of fuel remaining in the tanks is determined in units of volume (litres, US gallons or m³), these values have to be converted to mass values by using appropriate density values. The following formula shall be used:

$$M = V \cdot \rho \cdot f \quad (4)$$

⁵⁷ Guidance for the Aviation Industry, commissioned by the Dutch government, 2009.

Where:

M Mass of fuel [t]

V Volume of fuel, expressed as litres [L]

ρ (Actual) Density, expressed as [kg/L]. “Actual density” means density determined for the applicable temperature.

f Correction factor for making units consistent. If ρ is expressed as [kg/L], the value of f is 1t/1000kg. If V or ρ are expressed using non-SI units, such as gallons, lb/gal etc., appropriate values for the conversion factor f must be used⁵⁸.

New!

The aircraft operator shall use the same fuel density as used for operational and safety reasons, which may be either a standard value of 0.8 kg per litre or the actual density value (Article 53(5) of the MRR). The monitoring plan shall contain a written procedure describing how the actual or standard density factor is to be determined.

5.4.6 Emission factors

In general the aviation sector uses only a few types of – highly standardised – fuels. For the most commonly used fuels (Jet kerosene (Jet A1 or Jet A), Jet gasoline (Jet B) and Aviation gasoline (AvGas)), the MRR contains default values for the emission factor (EF, see section 2 of Annex III of the MRR). For other fuels the emission factor has to be determined in accordance with Article 32, i.e. by laboratory analyses (see guidance documents No. 1 and 5). However, the required information (carbon content / emission factor and net calorific value) may also be taken from purchasing records provided by the fuel supplier, provided that they have been derived based on internationally accepted standards (Article 53(7)).

Note: For CORSIA purposes, the emission factor of Jet-A is slightly different than for the EU ETS (3.16 t CO₂/ t fuel, instead of 3.15 in the EU ETS). However, CORSIA monitoring in the EU is fully aligned with the MRR. Therefore, aircraft operators have to use the same emission factor as for the EU ETS when reporting to the competent authority. However, when reporting data to ICAO, the Member State will recalculate the emissions using ICAO’s emission factor. The Commission’s AER⁵⁹ template contains a “switch” for the emission factor which aircraft operators can use for their own information about what their emissions would be under CORSIA. However, as stated above, when submitting their report, the EF is to be set to the EU value.

⁵⁸ For the definition of the SI system of units (the “metric system”), see <http://www.bipm.org/en/si/>. Conversion factors to US units can be found on the website of the U.S. National Institute of Standards and Technology (NIST), in particular under <http://www.nist.gov/pml/wmd/pubs/upload/AppC-12-hb44-final.pdf>

⁵⁹ Annual Emissions Report

5.4.7 Biofuels – Principles

Where biofuels are used, the emission factor is determined from the preliminary emission factor and the biomass fraction of the fuel:

$$EF = EF_{pre} \cdot (1 - BF) \quad (5)$$

Where:

EF Emission factor;

EF_{pre} Preliminary emission factor (i.e. the emission factor if assumed that the fuel is completely from fossil origin, see Article 3(36)⁶⁰);

BF biomass fraction [dimensionless], i.e. the percentage of carbon contained in the fuel which is considered biomass.

Note that the emission factor (EF) of biomass as defined by the MRR is zero. The above formula ensures that fuels containing a defined quantity of biofuel are correctly taken into account. However, in the case of aviation biofuels it may happen that pure biofuels are purchased before the blending process. In that case it is recommended to list the pure biofuel as separate source stream of 100% biomass fraction, and the “normal” jet fuel to which it is blended as a separate source stream of 0% biomass. Such an approach provides also for more transparency where a supply chain tracking system is used (see section 5.4.8). However, such separate reporting may also be useful for already blended fuels.

In order for biofuels to be zero-rated (i.e. for applying an emission factor of zero), the biofuel must satisfy the sustainability criteria defined by the RES Directive⁶¹. From 1 January 2022, the MRR requires that biofuels comply with the criteria set out in the RED II⁶².

Annex I (section 7.1 of this document) describes in detail how those criteria apply.



5.4.8 Attribution of (bio-)fuel to flights

Problem definition

The EU ETS deals with direct emissions from defined emission sources. In principle the monitoring of emissions is therefore aiming at correlating the reported emissions with the CO₂ molecules actually burnt from carbon contained in the fuel actually burnt. However, this is often not possible for aviation activities, where usually several fuel suppliers share a common infrastructure of tanks, pipelines and hydrants within an aerodrome. Furthermore the fuel remaining in the tank of an aircraft is repeatedly diluted by subsequent fuel uplifts. In order to avoid un-

⁶⁰ Article 3(36) MRR: ‘preliminary emission factor’ means the assumed total emission factor of a fuel or material based on the carbon content of its biomass fraction and its fossil fraction before multiplying it by the fossil fraction to produce the emission factor;

⁶¹ “Renewable Energy Sources Directive”, i.e. Directive 2009/28/EC on the promotion of the use of energy from renewable sources.

⁶² Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast).

reasonable monitoring costs, this situation could be simplified by allowing a decoupling of physical fuel and the quantities of fuel accounted for in the annual emission report, by using a system based on purchase records.

Any such decoupling must be highly transparent (i.e. providing a complete audit trail) and robust against double counting, i.e. the system used must ensure that each unit of tracked fuel can be consumed exactly once, no matter if used within the EU ETS, the CH or UK ETS, another system such as CORSIA or outside of a GHG regulation system. The only case of an acceptable double counting would be where one single flight is covered by more than one GHG emission reduction system.

A database (“registry”) is required which tracks each unit (tonne) of biofuel throughout the full supply chain, from feedstock and production over trade and transport, blending, purchase to final consumption. By tagging the fuel quantity with certificates of sustainability, such a system can serve also for providing evidence on the sustainability criteria. It is furthermore possible that such system is used at the same time for tracking the Member State’s quantities of renewable sources under the RES Directive’s obligations.

Because of the current low available quantities of biofuels it can be expected that biofuels will be available only at a small number of aerodromes (for the time being). If such tracking systems are installed, they should be open to all aircraft operators at the airport, and compatible with all GHG regulation systems applicable at that airport (e.g. EU ETS *and* CORSIA).

Where an aircraft operator carries out flights within and outside the EU ETS starting from airports where biofuels are available, the attribution of biofuel to the EU ETS can follow one of the following two options:

Option 1 – Accounting for physically traceable fuel

Under this option, the different fuels are attributed to the different flights as much corresponding to real fuel consumption as possible. For this purpose, the following principle *recommendations* are given:

- The biofuel uplift should always be assigned to the flight following that uplift. In principle such accounting only makes sense where the fuel is physically identifiably delivered, e.g. by a truck. At airports with pipeline/hydrant systems this will not be applicable.

Note: Where Method A is used for determining fuel quantity, this means that in addition to the usual data also the fuel uplift *before* the flight must be recorded. However, this means an additional effort only in case of an EU ETS flight following a non-ETS flight.

- It is assumed that usually significantly more fuel is consumed during the flight than remains in the tank. For mixed biofuels it can be usually assumed as a simplification that the fuel remaining in the tank is fossil fuel.
- Where two subsequent flights are carried out without fuel uplift in-between (“tankering”), the aircraft operator must split the said biofuel quantity and assign it to the two flights as appropriate. For this purpose the aircraft operator must use a suitable written procedure (see section 6.2) described in the monitoring plan and approved by the competent authority. A realistic, yet pragmatic approach should be used, e.g. making the split proportional to the

great-circle distances of those two flights, to the flight time (between block-off and block-on) or fuel consumed during the flights. When both flights are covered by the EU ETS, no split is required.

Option 2 – Simplified approach for accounting of biofuels

Under Article 54(3) of the MRR, the aircraft operator may use a monitoring method for the biomass amount consumed based on purchase records. When using such methodology, the aircraft operator may deviate from the “per flight” approach. Instead, the aircraft operator has to ensure that the total quantity of biofuel purchased complies with certain limits without further attributing the biofuel to specific flights. In particular, the aircraft operator has to be able to demonstrate to the CA and the verifier that:

Simplified!
New!

- The total amount of biofuel claimed does not exceed the total fuel usage of that aircraft operator for flights with allowance surrender obligation under the EU ETS (i.e. the reduced scope).
- The figure of biofuel accounted for under the EU ETS does not exceed the total quantity of biofuel purchased minus the total quantity of biofuel sold to third parties⁶³.
- The aggregated biomass fraction in the fuel claimed does not exceed the amount of biomass for which proof for meeting the sustainability criteria is provided.
- The same amounts of biofuel have not been accounted for in other GHG regulation systems, except where flights are covered by more than one such system.

The 2020 revision of the MRR provides a link in Article 54(3) to the EU-wide biofuel database which is to be developed pursuant to Article 28(2) of the RED II. Further guidance will be provided in an update of this document as soon as sufficient details about that database are available.

5.5 Monitoring approaches for tonne-kilometre data

Tonne-kilometres⁶⁴ shall be calculated for each flight covered by the EU ETS using the equation:

$$TKM = D \cdot PL = D \cdot ((F + M) + (P + B)) \quad (6)$$

Where:

TKM Tonne-kilometres [t·km]

D Distance expressed as [km]⁶⁵

⁶³ Third parties are in particular other aircraft operators, but also fuel suppliers. Therefore such trades must be fully traceable, so that the third party can itself claim the purchased biofuel, as appropriate.

⁶⁴ Note that the tonne-kilometres as defined by the M&R Regulation are usually *not* identical to the “revenue t-km” which are often monitored for the aircraft operator’s internal purposes.

⁶⁵ If distance is available in nautical miles, note the conversion factor of 1mi = 1.852km (see <http://www.nist.gov/pml/wmd/pubs/upload/AppC-12-hb44-final.pdf>).

PL Mass of Payload expressed as tonnes
F..... Mass of freight expressed as tonnes
M..... Mass of mail expressed as tonnes
P Mass of passengers expressed as tonnes
B Mass of checked baggage expressed as tonnes.

The distance is defined by Article 3(45) of the MRR and calculated as

$$D = GCD + 95km \quad (7)$$

Where:

D Distance expressed as [km]
GCD.... Great-Circle Distance expressed as [km]

5.5.1 Distance

According to section 3 of Annex III of the MRR, the Great Circle Distance shall be the shortest distance between any two points on the surface of the Earth, which shall be approximated using the system referred to in Article 3.7.1.1 of Annex 15 to the Chicago Convention (WGS 84)⁶⁶.

The latitude and longitude of aerodrome reference points (ARP) shall be taken either from aerodrome location data published in Aeronautical Information Publications (AIP) in compliance with Annex 15 of the Chicago Convention or from a source using AIP data.



Distances calculated by software or by a third party may also be used, provided that the calculation methodology is based on the formula set out in this section, AIP data and WGS 84 requirements.

Note: GCD is to be calculated on ground level, not flight level.

5.5.2 Payload

According to Article 3(48) of the MRR, “*payload*’ means the total mass of freight, mail, passengers and baggage carried onboard an aircraft during a flight”.

5.5.2.1 Mail and freight

Article 57(3) of the MRR requires: “*The aircraft operator shall determine the mass of freight and mail on the basis of the actual or standard mass contained in the mass and balance documentation for the relevant flights.*

Aircraft operators not required to have a mass and balance documentation shall propose in the monitoring plan a suitable methodology for determining the mass

⁶⁶ WGS 84 means the World Geodetic System, as described e.g. in http://en.wikipedia.org/wiki/World_Geodetic_System

of freight and mail, while excluding the tare weight of all pallets and containers that are not payload and the service weight.”

Care must be taken in particular to avoid double counting, e.g. of baggage which is already part of the passenger calculation (see 5.5.2.2).

5.5.2.2 Passengers and (checked) baggage

Article 57(4) of the MRR allows two options (tiers) for determining the mass of passengers (including their baggage):

- Tier 1: use of a default value of 100 kg for each passenger including their checked baggage;
- Tier 2: use of the mass for passengers and checked baggage contained in the mass and balance documentation for each flight.

The tier selected shall apply to all flights in the monitoring years (see section 3.5).

5.6 Small emitters

5.6.1 Eligibility as small emitter

Aircraft operators operating fewer than 243 flights per period for three consecutive four-month periods and aircraft operators operating flights with total annual emissions lower than 25 000 tonnes CO₂ per year shall be considered small emitters (Article 55(1) of the MRR). For these, special simplifications of the MRV system are applicable in order to reduce administrative costs.



Note that a new **additional simplification** regarding verification has been introduced by Regulation (EU) 421/2014 for aircraft operators emitting less than 25 000 t CO₂ per year (full scope) or less than 3 000 t CO₂ per year (reduced scope). The latter “small emitter threshold” was introduced by Regulation (EU) 2017/2392. Further details are explained in section 5.9.

For determination of the threshold, the annual emissions under the appropriate scope (see section 3.13.1) of the previous reporting year should be used, with exclusion of CO₂ stemming from biomass. Where this emission figure is not available (e.g. because the aircraft operator is new to the EU ETS), a conservative estimate should be used concerning the projected emissions, or an estimate using the tool described in section 5.6.2.

For assessing whether less than 243 flights per period are operated, the four month periods are January to April, May to August and September to December. The local time of departure of the flights determines in which four month-period a flight has to be taken into account. The flights exempted by Annex I of the EU ETS Directive (see section 3.1.1) are not to be included in assessing the number of flights or the total amount of annual emissions.

A special situation then arises if the aircraft operator’s emissions exceed the small emitter threshold. In that case it is necessary to revise the monitoring plan and submit a new one to the CA, for which the simplifications for small emitters are not applied any more. However, the wording of Article 55(4) of the MRR suggests that the aircraft operator should be allowed to continue using the small emitter tool provided that the aircraft operator can demonstrate to the competent authority that the threshold has not been exceeded in the previous five years and will

not be exceeded again. Thus, high emissions or a larger number of flights in one single year out of five years may be tolerable. However, if the small emitter threshold is exceeded again in one of the following five years, that exception will not be applicable any more.



5.6.2 Use of the small emitter tool

Article 55 of the MRR allows small emitters to “*estimate the fuel consumption using tools implemented by Eurocontrol or another relevant organisation, which can process all relevant air traffic information and avoid any underestimations of emissions*” if such tool has been approved by the Commission. At the time of updating this guidance (February 2021) the small emitter tool by Eurocontrol is the only tool approved⁶⁷ by the Commission. It is found at



<https://www.eurocontrol.int/tool/small-emitters-tool>

Using this tool the aircraft operator can estimate the fuel consumption based on the distance of the flight and the aircraft type used. This fuel consumption can then be used instead of a value determined in accordance with section 5.4.3, for calculating the emissions in accordance with equation (1) in section 5.4.1. For the emission factor, a small emitter will usually use a default value from Annex III of the MRR. However, if biofuels or other unconventional fuels are used, sections 5.4.6 and 5.4.7 apply.

Notes:

- A more sophisticated tool, although not free of charge, is the “EU ETS support facility” (see section 5.8).
- There is no obligation to use the small emitter tool. Any small emitter is allowed to use the standard monitoring methodology instead, if the aircraft operator wishes to have more accurate emissions data. However, a consequence of using the small emitter tool is the strong simplification of the monitoring plan (which is taken into account in the Commission’s monitoring plan templates).
- The simplified procedures for small emitters only apply to emissions reporting. The requirements for monitoring and reporting tonne-kilometre data by small emitters are the same as for other aircraft operators.



5.7 Allowed methodology for data gaps

The aircraft operator’s monitoring plan, including the associated written procedures should be sufficiently robust to avoid data gaps in general. However, if nevertheless data gaps occur in emissions data, the aircraft operator shall use surrogate data for the respective time period. For this purpose he will use a calculation method defined already in the monitoring plan (Article 66(2) of the MRR).

⁶⁷ For the approval see Commission Regulation (EU) No. 606/2010, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:175:0025:0026:EN:PDF>

That Article allows in particular that the same tool as for small emitters (see section 5.6.2) may be used for this purpose, including for non-small emitters.

Where the number of flights with data gaps exceeds 5% of the annual flights that are reported, the operator shall inform the competent authority thereof without undue delay and shall take remedial action for improving the monitoring methodology. Furthermore, the percentage of flights with data gaps has to be reported in the annual emissions report.

New!

5.8 The EU ETS support facility

A further development, which exceeds the possibilities of the small emitter tool (see section 5.6.2), is the "EU ETS support facility", another tool provided by Eurocontrol, which can be used by aircraft operators on a voluntary basis. It can be found at:

Simplified!

<https://www.eurocontrol.int/service/emissions-trading-system-support>



This tool was originally designed for competent authorities and has now been made available also for aircraft operators⁶⁸, and if they wish so, also for their verifiers. According to Eurocontrol's website, the tool delivers:

- a **draft annual emissions report**, presenting what the aircraft operator's report would be if based on the flight data information available to Eurocontrol and on the fuel burn and CO₂ emissions estimated by Eurocontrol by applying the same methodology as used in the Eurocontrol small emitters tool. This draft report is provided in the form of an Excel file compliant with the reporting format definition of the Commission's templates. This report includes also the "kilometres" data for the airport pairs contained in the report (for the tonne-kilometre verification);
- a text file in a comma separated file (csv) format containing **the list of the flights attributed to the Aircraft Operator and operating in the ETS area** (both included and exempted flights) with details allowing the identification of the flight and the reasons for its inclusion, exemption, the attribution to the operator, and the "kilometre" data (departure airport, destination airport, departure date and time, call sign, aircraft registration mark – if available –, flown distance, applicable route charge exemption – if any –, estimated fuel consumption, estimated CO₂ emissions, possible ETS exemption as determined by Eurocontrol) upon which the Aircraft Operator's draft annual emissions report is built.
- There are furthermore functions supporting the user in tasks related to CORSIA (e.g. performing syntax and order of magnitude checks on emissions reports) and the Swiss ETS.

New!

The support facility can be used as follows:

⁶⁸ Note that charges set by Eurocontrol apply for the use of this support facility. Its use is purely voluntary.

- Small emitters can use it for generating their draft annual emissions report as further simplification beyond the small emitter tool.
- Other aircraft operators and service companies can use it for corroborating the result of their monitoring, including for checking the list of included aircraft and flights.
- Aircraft operators can make the data available to their verifiers, for a similar purpose.

Note that there is no requirement in the MRR for using the support facility, but it may be a potential means to reduce compliance costs and verification costs.

5.9 Further simplification regarding verification

Small emitters who emit less than 25 000 t CO₂ per year (full scope, see section 3.2.2) or less than 3 000 t CO₂ per year (reduced scope), and who have chosen to use the Eurocontrol small emitters tool populated independently by Eurocontrol with data from the ETS Support Facility (see section 5.8) for generating their Annual Emission Report (AER), **do not need to seek external verification of the AER** (Article 28a(6) of the EU ETS Directive, as amended by Regulation (EU) 421/2014 and Regulation (EU) 2017/2392).

Notes:

- This exemption does not exclude that such small aircraft operators still let their AER be verified by an accredited verifier as an additional means of quality control.
- The exemption does not apply to small emitters which operate less than 243 flights per 4-month period, but have higher emissions than 25 000 t CO₂ per year (full scope). Neither does it apply to aircraft operators who base their AER on other data than those generated by the ETS support facility and filled in independently by Eurocontrol.
- Because of differences in administrative procedures and IT systems in the Member States, aircraft operators are advised to check the relevant websites or to get in contact with the competent authority of their administering Member State in order to explore the administrative procedures for how to submit an annual emission report without verification.

6 THE MONITORING PLAN

6.1 Developing a monitoring plan

When developing a monitoring plan, aircraft operators should follow some guiding principles:

- Knowing in detail the situation of their operations, aircraft operators should make the monitoring methodology as simple as possible. This is achieved by attempting to use the most reliable data sources, robust metering instruments, short data flows, and effective control procedures.
- Aircraft operators should imagine their annual emission report from verifier's perspective. What would a verifier ask about how the data has been compiled? How can the data flow be made transparent? Which controls prevent errors, misrepresentations, omissions?
- Because aircraft operators usually undergo technical changes (not only regarding their fleet) over the years, monitoring plans must be considered living documents to a certain extent. In order to minimise administrative burden, aircraft operators should be careful which elements must be laid down in the monitoring plan itself, and what can be covered under written procedures supplementing the MP.

Important note: The monitoring plan always has to reflect the methodology and tiers (only applicable for MP for the t-km report) actually applied, not the minimum requirements. The general principle is that aircraft operators should attempt to improve their monitoring systems wherever possible.

Small operators (for definition see section 5.6.1) may apply significantly simplified monitoring methodologies for emissions (see section 5.6.2 and section 5.9). If an aircraft operator is approved to use this simplification, then the monitoring plan also follows reduced requirements.



6.2 Procedures and the monitoring plan

The monitoring plan should ensure that the aircraft operator carries out all the monitoring activities consistently over the years, like according to a recipe book. In order to prevent incompleteness, or arbitrary changes by the aircraft operator, the competent authority's approval is required. However, there are always elements in the monitoring activities, which are less crucial, or which may change frequently.

The M&R Regulation provides a useful tool for such situations: Such monitoring activities may (or even shall) be put into "written procedures"⁶⁹, which are mentioned and described briefly in the MP, but are not considered part of the MP. These procedures are tightly linked to, but not part of the monitoring plan. They must be just described in the MP with such level of detail that the CA can understand the content of the procedure, and can reasonably assume that a full documentation of the procedure is maintained and implemented by the aircraft operator. The full text of the procedure would be delivered to the competent authority

⁶⁹ Article 11(1) 2nd sub-paragraph: "The monitoring plan shall be supplemented by written procedures which the operator or aircraft operator establishes, documents, implements and maintains for activities under the monitoring plan, as appropriate."

only upon request. The aircraft operator shall also make procedures available for the purposes of verification (Article 12(2)). As a result, the aircraft operator has the full responsibility for the procedure. This gives him the flexibility to make amendments to the procedure whenever needed, without requiring update of the monitoring plan, as long as the procedure's content stays within the limitations of its description laid down in the monitoring plan.

The MRR contains several elements which are by default expected to be put into written procedures, such as:

- Tracking the completeness of the list of emission sources (aircraft operated) over the reporting year;
- Defining the monitoring methodology for additional aircraft types;
- Monitoring the completeness of the list of flights operated under the unique ICAO designator by aerodrome pair;
- Determining whether flights are covered by Annex I of the EU ETS Directive, ensuring completeness and avoiding double counting;
- Monitoring fuel consumption per flight, in both owned and leased-in aircraft;
- Determining the density used for fuel uplifts and fuel in tanks, in both owned and leased-in aircraft (operated under your ICAO designator);
- Cross checks between uplift quantities from invoices and uplifts from on-board devices;
- Determination of emissions factor, net calorific value and biomass content of alternative fuels;
- Monitoring aerodrome location information;
- Determining the Great Circle Distance between aerodrome pairs;
- Monitoring the number of passengers on a flight;
- Monitoring the mass of freight and mail on a flight;
- Managing responsibilities and competency of personnel;
- Data flow and control procedures (see section 6.3);
- Quality assurance measures;
- Estimation method for substitution data where data gaps have been found;
- Regular review of the monitoring plan for its appropriateness.

The MRR furthermore outlines how the procedure must be described in the monitoring plan. Note that for aircraft operators with simple operations also the procedures will usually be very simple and straightforward. Where the procedure is very simple, it may be useful to use the procedure text immediately as “description” of the procedure as required for the monitoring plan.



Table 3 outlines the necessary elements of information required to be put into the monitoring plan for each procedure (Article 12(2) of the MRR), and gives an example for procedures.

Table 3: Example related to the management of staff: Descriptions of a written procedure as required in the monitoring plan.

Item according to Article 12(2)	Possible content (examples)
Title of the procedure	ETS personnel management
Traceable and verifiable reference for identification of the procedure	ETS 01-P
Post or department responsible for implementing the procedure and the post or department responsible for the management of the related data (if different)	HSEQ deputy head of unit
Brief description of the procedure ⁷⁰	<ul style="list-style-type: none"> Responsible person maintains a list of personnel involved in ETS data management Responsible person holds at least one meeting per year with each involved person, at least 4 meetings with key staff as defined in the annex of the procedure; Aim: Identification of training needs Responsible person manages internal and external training according to identified needs.
Location of relevant records and information	<p>Hardcopy: HSEQ Office, shelf 27/9, Folder identified "ETS 01-P".</p> <p>Electronically: "P:\ETS_MR\manag\ETS_01-P.xls"</p>
Name of the computerised system used, where applicable	N.A. (Normal network drives)
List of EN standards or other standards applied, where relevant	N.A.

6.3 Data flow and control system

Monitoring of emissions data is more than just reading instruments or fuel invoices. It is of utmost importance to ensure that data are produced, collected, processed and stored in a controlled way. Therefore the aircraft operator must define instructions for "who takes data from where and does what with the data". These "data flow activities" (Article 58 of the MRR) form part of the monitoring plan (or are laid down in written procedures, where appropriate (see section 6.2)). A data flow diagram is often a useful tool for analysing and/or setting up data flow procedures. Examples for data flow activities include reading from instruments, aggregating data, calculating the emissions from various parameters, and storing all relevant information for later use.

⁷⁰ This description is required to be sufficient clear to allow the operator, the competent authority and the verifier to understand the essential parameters and operations performed.

As human beings (and often different information technology systems) are involved, mistakes in these activities can be expected. The M&R Regulation therefore requires the aircraft operator to establish an effective control system (Article 59 of the MRR). This consists of two elements:

- a risk assessment, and
- control activities for mitigating the risks identified.

“Risk” is a parameter which takes into account both, the probability of an incident and its impact. In terms of emission monitoring, the risk refers to the probability of a misstatement (omission, misrepresentation or error) being made, and its impact in terms of annual emissions figure.

When the aircraft operator carries out a risk assessment, he analyses for each point in the data flow needed for the monitoring of the emissions of all his aviation activities as far as covered by the EU ETS, whether there would be a risk of misstatements. Usually this risk is expressed by qualitative parameters (low, medium, high) rather than by trying to assign exact figures. He furthermore assesses potential reasons for misstatements (such as paper copies being transported from one department to another, where delays may occur, or copy & paste errors may be introduced), and identifies which measures might reduce the found risks, e.g. sending data electronically and storing a paper copy in the first department; search for duplicates or data gaps in spreadsheets, control check by an independent person (“four eyes principle”), etc.

Measures identified to reduce risks are implemented. The risk assessment is then re-evaluated with the new (reduced) risks, until the aircraft operator considers that the remaining risks are sufficiently low for being able to produce an annual emissions report which is free from material misstatement(s)⁷¹.

The control activities are laid down in written procedures and referenced in the monitoring plan. The results of the risk assessment (taking into account the control activities) are submitted as supporting documentation to the competent authority when approval of the monitoring plan is requested by the aircraft operator.

Aircraft operators are required to establish and maintain written procedures related to control activities for at least (Article 59(3)):

- a. quality assurance of the measurement equipment;
- b. quality assurance of the information technology system used for data flow activities, including process control computer technology;
- c. segregation of duties in the data flow activities and control activities and management of necessary competencies;
- d. internal reviews and validation of data;
- e. corrections and corrective action;
- f. control of out-sourced processes;
- g. keeping records and documentation including the management of document versions.

⁷¹ The aircraft operator should strive to produce “error-free” emission reports (Article 7: Aircraft operators “shall exercise due diligence to ensure that the calculation and measurement of emissions exhibit the highest achievable accuracy”). However, verification cannot produce 100% assurance. Instead, verification aims at providing a reasonable level of assurance that the report is free from material misstatements. For further information see the Explanatory Guidance (EGD I) on the A&V Regulation. Section 2.3 provides a link to those documents.

Small emitters: Article 55(3) of the MRR exempts small emitters (see section 5.6.1) from submitting a risk assessment when submitting the monitoring plan for approval by the competent authority. However, aircraft operators will still find it useful to carry out a risk assessment for their own purposes. It has the advantage of reducing the risk of under-reporting, under-surrender of allowances and consequential penalties, and also over-reporting and over-surrender.



More information can be found in Guidance document No. 6 (“Data flow activities and control system”), and some examples are available as GD 6a.



6.4 Uncertainty assessment as supporting document

In contrast to the requirements regarding uncertainty assessment for stationary installations, the requirements for aircraft operators are relatively simple, as laid down in Article 56 of the MRR:

- The aircraft operator shall consider sources of uncertainty and their associated levels of uncertainty when selecting the monitoring methodology.
- The aircraft operator shall regularly perform suitable control activities, including cross-checks between the fuel uplift quantity as provided by invoices and the fuel uplift quantity indicated by on-board measurement, and take corrective action if notable deviations are observed.

When submitting a new or updated monitoring plan, the aircraft operator must choose a suitable monitoring methodology (Section 1 of Annex III of the MRR) considering associated levels of uncertainty. Pursuant to Article 12(1), operators of installations have to submit an uncertainty assessment as supporting document together with the monitoring plan. For aircraft operators this requirement has been waived by the 2018 review of the MRR.

New!

Section 7.3 in the Annex of this document gives a short introduction to the concept of uncertainty⁷². It also includes a calculation example.

6.5 Keeping the monitoring plan up to date

The monitoring plan must always correspond to the current nature and functioning of the aircraft operator’s activities. Where the practical situation of the aircraft operator is modified, e.g. because fuels, measuring equipment, IT systems, or organisation structures (i.e. staff assignments) are changed (where relevant for the monitoring of emissions), the monitoring methodology must be updated (Article 14)⁷³. Depending on the nature of the changes, one of the following situations can occur:

⁷² Furthermore guidance document No. 4 gives further details. However, that document is addressed to operators of installations in the EU ETS. Under normal circumstances reading that document should not be necessary for aircraft operators.

⁷³ Article 14(2) lists a minimum of situations in which a monitoring plan update is mandatory: “(a) new emissions occur due to new activities being carried out or due to the use of new fuels or materials not yet contained in the monitoring plan; (b) change in the availability of data, due to the use of new types of measuring instrument, sampling methods or analysis methods, or for other reasons, leads to higher accuracy in the determination

- If an element of the monitoring plan itself needs updating, one of the following situations can apply:
 - The change to the monitoring plan is a significant one. This situation is discussed in section 6.5.1. In case of doubt, the aircraft operator has to assume that the change is significant.
 - The change to the monitoring plan is not significant. The procedure described under 6.5.2 applies.
- An element of a written procedure is to be updated. If this doesn't affect the description of the procedure in the monitoring plan, the aircraft operator will carry out the update under his own responsibility without notification to the competent authority.

The same situations may occur as a consequence of the requirement to improve the monitoring methodology continuously (see section 6.6).

The M&R Regulation in Article 16(3) also defines the requirements for record keeping about any monitoring plan updates, such that a complete history of monitoring plan updates is maintained, which allows a fully transparent audit trail, including for the purposes of the verifier.



For this purpose it is considered best practice for the aircraft operator to make use of a “logbook”, in which all non-significant changes to the monitoring plan and to procedures are recorded, as well as all versions of submitted and approved monitoring plans. This must be supplemented with a written procedure for regular assessment of whether the monitoring plan is up to date (Article 14(1) and point 1(f) of section 2 of Annex I of the MRR).

6.5.1 Significant changes

Whenever a significant change to the monitoring plan is necessary, the aircraft operator shall notify the update to the competent authority without undue delay. The competent authority then has to assess whether the change is indeed a significant one. Article 15(4) of the MRR contains a (non-exhaustive) list of monitoring plan updates which are considered significant⁷⁴. If the change is not significant, the procedure described under 6.5.2 applies. For significant changes, the

of emissions;
 (c) *data resulting from the monitoring methodology applied previously has been found to be incorrect;*
 (d) *changing the monitoring plan improves the accuracy of the reported data, unless this is technically not feasible or incurs unreasonable costs;*
 (e) *the monitoring plan is not in conformity with the requirements of this Regulation and the competent authority requests the operator or aircraft operator to modify it;*
 (f) *it is necessary to respond to the suggestions for improvement of the monitoring plan contained in a verification report.”*

⁷⁴ Article 15(4):

“4. Significant changes to the monitoring plans of an aircraft operator include:

(a) with regard to the emission monitoring plan:

(i) a change of emission factor values laid down in the monitoring plan;

(ii) a change between calculation methods as laid down in Annex II, or a change from the use of a calculation method to the use of estimation methodology in accordance with Article 55(2) or vice versa;

(iii) the introduction of new source streams;

(iv) changes in the status of the aircraft operator as a small emitter within the meaning of Article 55(1) or with regard to one of the thresholds provided by Article 28a(6) of Directive

competent authority thereafter carries out its normal process of approving monitoring plans⁷⁵.

The approval process may sometimes need longer than implementing the proposed change of the monitoring plan. Furthermore the competent authority may find the aircraft operator's monitoring plan update incomplete or inappropriate and may require additional amendments of the monitoring plan. Thus, monitoring according to the old monitoring plan may be incomplete or lead to inaccurate results, while the aircraft operator is not sure whether the new monitoring plan will be approved as requested. The MRR provides for a pragmatic approach here:

According to Article 16(1) of the MRR, the aircraft operator shall immediately apply the new monitoring plan where he can reasonably assume that the updated monitoring plan will be approved as proposed. This may apply e.g. when an additional fuel is introduced. Where the new monitoring plan is not yet applicable, because the situation of the aircraft operator will change only after the approval of the monitoring plan by the competent authority, monitoring is to be carried out in accordance with the old monitoring plan until the new one is approved.

Where the aircraft operator is unsure whether the CA will approve the changes, he shall carry out monitoring in parallel using both the new and the updated monitoring plan (Article 16(1)). Upon receiving the approval of the competent authority, the aircraft operator shall use only the data obtained in accordance with the new monitoring plan from the date from which that version of the monitoring plan is applicable (Article 16(2)).



6.5.2 Non-significant updates of the monitoring plan

While significant updates of the monitoring plan are to be notified without undue delay, the competent authority may allow the aircraft operator to delay the notification of non-significant updates in order to simplify the administrative process (Article 15(1) of the MRR). Where this is the case and the aircraft operator can reasonably assume that changes to the monitoring plan are non-significant, they may be collected and submitted to the CA once a year (by 31 December of the same year), if the competent authority allows this approach.

Simplified!

The final decision on whether a change to the monitoring plan is significant is the responsibility of the competent authority. However, an aircraft operator can reasonably anticipate that decision in many cases:

- Where a change is comparable to one of the cases listed in Article 15(4) of the MRR, the change is significant;

2003/87/EC;

(b) with regard to the tonne-kilometre data monitoring plan:

- (i) a change between a non-commercial and commercial status of the air transport service provided;
- (ii) a change in the object of the air-transport service, the object being passengers, freight or mail."

⁷⁵ This process may differ between Member States. The usual procedure will include a completeness check for the information provided, a check for the appropriateness of the new monitoring plan in regard of the changed situation of the aircraft operator, and a check for compliance with the M&R Regulation. The competent authority may also reject the new monitoring plan or require further improvements. The competent authority may also come to the conclusion that the proposed changes are not significant ones.

- Where the impact of the proposed monitoring plan change on the overall monitoring methodology or on the risks for error is small, it may be non-significant;
- In case of doubt assume it is a significant change and follow section 6.5.1.

Non-significant changes do not need the approval of the competent authority. However, in order to provide for legal certainty, the competent authority must inform the aircraft operator without undue delay of its decision to consider changes non-significant where the aircraft operator has notified them as significant. Aircraft operators can be expected to appreciate if the competent authority acknowledges receipt of notifications in general.

6.6 The improvement principle

While the previous section has dealt with monitoring plan updates which are mandated as consequence of factual changes of the aircraft operators operations, the MRR also requires the aircraft operator to explore possibilities to improve the monitoring methodology for emissions and – where relevant – tonne-kilometre data when the operations themselves are unchanged. For implementing this “improvement principle”, there are two requirements:

- Aircraft operators must take account of the recommendations included in the verification reports issued pursuant to Article 15 of Directive 2003/87/EC (Article 9), and
- Aircraft operators must check regularly on their own initiative, whether the monitoring methodology can be improved (Article 14(1) and Article 69(1) of the MRR).

Aircraft operators must react to those findings on possible improvements by

- Sending a report on the proposed improvements to the competent authority for approval,
- Updating the monitoring plan as appropriate (using the procedures outlined in sections 6.5.1 and 6.5.2), and
- Implementing the improvements according to the time table proposed in the approved improvement report.

For the improvement report responding to a verifier’s recommendations, the deadline is 30 June of the year in which the verification report is issued. The deadline of 30 June may be extended by the competent authority up to 30 September of the same year.

New!

If the aircraft operator has already submitted an updated monitoring plan resolving all open issues to the competent authority before the deadline for the improvement report, there is no need to submit an improvement report (Article 69(5)).

7 ANNEX

7.1 Annex I: Demonstrating compliance with sustainability criteria for biofuels

Note: In order to make this guidance document a self-standing information source for aircraft operators, section 7.1 is a copy of the relevant part of guidance document No.3 (Biomass issues in the EU ETS). Thus, reading GD3 should not be a requirement for aircraft operators anymore.

Note (October 2021): Currently the relevant guidance (implementing acts under the RED II) is under development. As soon as these acts are published, an update of GD 3 is envisaged. The relevant sections will then again be made available here.

Section 7.1 of this document still applies until 31 December 2021.

7.1.1 Definitions

Article 3(21) of the MRR contains the definition of biomass. It has been completely aligned with the definition in the RES Directive⁷⁶: *“Biomass’ means the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste; it includes bioliquids and biofuels.”*

This definition is supplemented by two subsidiary definitions, also taken from the RES-D: *“bioliquids’ means liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass.”* and *“biofuels’ means liquid or gaseous fuel for transport produced from biomass”*.

The most important implication of these new definitions becomes obvious in the context of recital 2 of the MRR⁷⁷: Due to the zero-rating of emissions from biomass, the EU ETS constitutes a support scheme within the meaning of the RES-D. Pursuant to Article 17(1) of the RES-D, bioliquids and biofuels may only receive support and count towards the national targets where they comply with sustainability criteria set out in Article 17 of that Directive. Consequently, **the sus-**



⁷⁶ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF>

⁷⁷ Recital 2: *“The definition of biomass in this Regulation should be consistent with the definition of the terms ‘biomass’, ‘bioliquids’ and ‘biofuels’ set out in Article 2 of Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC(), in particular since preferential treatment with regard to allowance surrender obligations under the Union’s greenhouse gas emission allowance trading scheme pursuant to Directive 2003/87/EC constitutes a ‘support scheme’ within the meaning of Article 2(k) and consequently financial support within the meaning of Article 17(1)(c) of Directive 2009/28/EC.”*

sustainability criteria must be applied for biofuels and bioliquids that are consumed and zero-rated for greenhouse gas emissions within an installation or an aircraft operator's activities covered by the EU ETS.



Note: “Applying the sustainability criteria” within this guidance document means using the sustainability criteria for deciding whether a fuel or material falls within the definition of biomass, and consequently whether its emission factor is zero⁷⁸. A biogenic material which does not comply with the relevant sustainability criteria of the RES Directive, where they are applicable, is considered as fossil, i.e. the emission factor is greater than zero.



7.1.2 Implications of the sustainability criteria

The application of sustainability criteria leads to the following types of source streams (some may appear as theoretical cases):

1. Fossil source streams
2. Biomass where sustainability criteria apply (currently biofuels and bioliquids as defined by the MRR):
 - a. Criteria are satisfied: Biomass is zero-rated
 - b. Criteria are not satisfied: Biomass is treated like a fossil source stream.
3. Biomass where no sustainability criteria apply: Always zero-rated.
4. Mixed source streams:
 - a. Fossil / biomass mix (where either no sustainability criteria apply, or where they apply and are satisfied): The emission factor is the preliminary emission factor⁷⁹ multiplied by the fossil fraction.
 - b. Fossil / biomass mix (where sustainability criteria apply and are not satisfied): The whole source stream is treated as fossil.
 - c. Biomass mix or fossil / biomass mix, where only a part of the biomass satisfies the applicable sustainability criteria: These source streams are to be treated like those under point 4a, with the non-sustainable part considered as part of the fossil fraction.



Examples:

- Point 4(a): This could be fibre wood panels, where biomass (wood, which is solid, and therefore no sustainability criteria are to be applied at the time of writing this guidance) is mixed with resins which are usually made from fossil raw materials.
- Point 4(b): This could be a liquid fuel where the supplier claims that x% bio-fuel has been added, but does not provide evidence in accordance with section 7.1.3 of this guidance for that amount.
- Point 4(c): An example would be rape seed methyl ester (“biodiesel”), where the rape seed oil satisfies the sustainability criteria and respective evidence

⁷⁸ This guidance also uses the term “zero rated” for expressing that the emission factor of a fuel or material, or for a defined fraction of a mixed material is counted as zero.

⁷⁹ Article 3(36) of the MRR defines: ‘preliminary emission factor’ means the assumed total emission factor of a fuel or material based on the carbon content of its biomass fraction and its fossil fraction before multiplying it by the fossil fraction to produce the emission factor.

is provided, while the methanol is either stemming from fossil sources, or where it is claimed to be biomass, but no evidence for meeting the sustainability criteria is available.

Note that the above classification assumes that the whole source stream has the same composition, or is analysed using the same methodology where calculation factors are not based on default values⁸⁰. However, the situation may occur that a certain biofuel is used, where some batches delivered do satisfy the sustainability criteria, while other batches do not. In such a case it would not be appropriate to consider this material as one source stream with different biomass fraction values, but rather as two distinct source streams, one being fossil, one biomass. The simplifications of Articles 38 and 39 of the MRR would only apply to the biomass source stream.



A similar caveat applies to mixed source streams where the biomass fraction only sometimes complies with the relevant sustainability criteria.

The above considerations lead to practical consequences when setting up the monitoring plan in relation to biofuels (as defined): The simplest way forward would be to establish a written procedure⁸¹ which requires the operator to attribute each batch of biomass used in the installation to either a (sustainable) “biomass” source stream or to a “fossil” source stream, depending on whether a proof is available for meeting the sustainability criteria or not. The ways of obtaining such proof are discussed in section 7.1.3 below.



7.1.3 Practical approach for sustainability criteria

The Commission has set up a “transparency platform” for publication of all kinds of information related to the RES Directive in general and the sustainability criteria in particular. It can be found at:



<http://ec.europa.eu/energy/en/topics/renewable-energy>.

Furthermore two communications have been published which can help in the understanding of the sustainability criteria. These are:

- Communication from the Commission on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels (2010/C 160/02); and
- Communication from the Commission on voluntary schemes and default values in the EU biofuels and bioliquids sustainability scheme (2010/C 160/01).

For all issues regarding the assessment of sustainability criteria for individual materials, guidance published on that website should be consulted.

⁸⁰ Similar to e.g. different batches of coal which are analysed separately, but all reported under the same source stream “coal”.

⁸¹ See guidance document no. 1 on the topic of “written procedures” as supplement to the monitoring plan.

According to the RES-Directive, there are three ways in which economic operators can demonstrate compliance with the sustainability criteria for bioliquids and biofuels:

- by means of a ‘national system’;
- by using a ‘voluntary scheme’ that the Commission has recognised⁸²;
- in accordance with the terms of a bilateral or multilateral agreement concluded by the Union and which the Commission has recognised for this purpose⁸³.

Nonetheless, for EU ETS zero-rating, the burden of proof concerning a bio-fuel (or bioliquid) as defined meeting the requisite sustainability criteria remains with the EU ETS operator or aircraft operator. Possible proof can be provided from applicable documentation ensuring compliance with a national system or the availability of certificates containing evidence of sustainability issued under a sustainability scheme approved by the Commission under the RES-Directive (see sections 7.1.3.2 to 7.1.3.4). The evidence provided should furthermore indicate the amount of delivered biomass and identify the batch to which they relate.

Where such status cannot be confirmed to the satisfaction of the competent authority⁸⁴ concerned, the biofuel will have to be treated as a fossil source stream and not zero-rated.

7.1.3.1 General responsibilities



The Member State where the installation is situated, or the administering Member State in case of aircraft operators, is responsible for defining the rules under which compliance with the sustainability criteria must be demonstrated for the biofuels or bioliquids used within the Member State.

That Member State also has to define which economic operator (i.e. the producer, supplier or user) of the biomass has to demonstrate compliance with the sustainability criteria, i.e. from whom the operator of the installation or the aircraft operator can obtain the appropriate evidence. If the Member State has not explicitly made other arrangements, it is appropriate in case of the EU ETS that the burden of proof will be on the user of the biomass, i.e. the operator of the installation or the aircraft operator, as these are the persons who have the obligation of reporting emissions. However, for practical reasons, the operator or aircraft operator will have to rely on data⁸⁵ provided by third parties, i.e. either the supplier or producer of the bioliquid/biofuel.

⁸² Communication 2010/C160/01 clarifies: “For bioliquids, the Commission cannot explicitly recognise a voluntary scheme as a source of accurate data for the land related criteria. However, where the Commission decides that a voluntary scheme provides accurate data as far as biofuels are concerned, the Commission encourages Member States to accept such schemes equally for bioliquids.”

⁸³ At the time of writing this guidance, no such agreements have been concluded yet.

⁸⁴ Not only the competent authority, but also the verifier during verification will assess if the evidence for meeting the sustainability criteria is sufficient.

⁸⁵ Depending on the applicable scheme for proving sustainability criteria, those data must be certified.

7.1.3.2 National systems

Member States' implementations of the RES-D are currently using diverse approaches. At the time of writing this guidance, no complete overview of Member States' national systems on biomass is available. Operators and aircraft operators should obtain information on national systems from the relevant competent authority.

Although the RES Directive does not explicitly require a Member State to publish dedicated information, they are also not prohibited from doing so. For the purpose of the EU ETS, Member States are therefore encouraged to consider practical ways of making information available to the public regarding the sustainability of biofuels and bioliquids (by producer, brand, generic type or other suitable grouping), suppliers or producers thereof, or similar information, which allow the user of these bioliquids or biofuels (and any EU ETS verifier) to gather assurance that a material complies with the applicable sustainability criteria.

Because national systems are not harmonised across the EU, it may be especially difficult for operators to comply with these systems where biomass is consumed which is produced in another Member State. Therefore the use of voluntary systems may be more desirable in those cases. For the same reason aircraft operators will benefit from the use of voluntary systems for biofuels they consume in countries other than their administering Member State.



7.1.3.3 Voluntary systems

Details on all approved voluntary systems can be found on the Commission's transparency platform⁸⁶. The most important aspect of the voluntary schemes is their applicability across the EU in a harmonised manner. This means that a biofuel certified under such an approved scheme will have to be recognised as sustainable in all Member States. For bioliquids Member States are encouraged to recognise the voluntary schemes in a similar way⁸⁷.

An operator who purchases a bioliquid or biofuel which has received a certificate of compliance with an approved voluntary scheme, may in any case assume that this bioliquid or biofuel can be considered sustainable under the RES Directive, and can be used with an emission factor of zero in the EU ETS⁸⁸. However, there are important limitations:

- The operator has to be aware that some voluntary schemes are approved only for some of the required sustainability criteria. If applicable, another proof must be obtained for the remaining criteria.
- Some sustainability schemes have an international background. Some have set up an "EU version" of the same overarching scheme. Usually the EU version has more stringent sustainability criteria in order to comply with the RES-D. Therefore only the EU version is approved by the Commission. Operators, verifiers and competent authorities should be aware of these differences, and only certificates which explicitly refer to those EU versions of the voluntary schemes are eligible for zero-rating in the EU ETS.

⁸⁶ <http://ec.europa.eu/energy/en/topics/renewable-energy>

⁸⁷ For bioliquids see the caveat in footnote 82.

⁸⁸ In case of mixed materials or fuels, obviously the zero-rating applies only to the biomass fraction.

- Some schemes are approved with limited geographical scope.
- The Commission's approvals of voluntary schemes are usually valid for five years. Only bioliquid or biofuel supplies covered by a valid approval are eligible for zero-rating in the EU ETS.

7.1.3.4 Bi- or multilateral agreements

Currently no such agreements have been concluded. Operators are advised to check the Commission's transparency platform⁸⁹ when in doubt whether this situation has changed.

7.2 Annex II: Unreasonable costs

Note: This section of the annex is included in this guidance only for completeness reasons. It explains the concept of unreasonable cost, which is not as important for aircraft operators as for operators of stationary installations in the EU ETS. Consequently, this section is taken from guidance document No. 1, and gives also examples for installations.

Simplified!

Cost effectiveness is an important concept for the MRR. It is generally possible for the (aircraft) operator to get permission from the competent authority to derogate from a specific requirement of the MRR, if fully applying the requirement would lead to **unreasonable costs**. Therefore a clear-cut definition for "unreasonable costs" is required. It is found in Article 18 of the M&R Regulation. As outlined below, it is based on a cost/benefit analysis for the requirement under consideration.

Similar derogations may be applicable if a measure is **technically not feasible**. Technical feasibility is not a question of cost/benefit, but whether the (aircraft) operator is able to achieve a certain requirement at all. Article 17 of the MRR requires that an (aircraft) operator provides a justification where he claims something to be technically not feasible. This justification must demonstrate that the (aircraft) operator does not have the resources available to meet the specific requirement within the required time.

When assessing whether costs for a specific measure are reasonable, the costs are to be compared with the benefit it would give. Costs are considered unreasonable where the costs exceed the benefit (Article 18 of the MRR). The detailed description of the cost-benefit analysis is a new element in the MRR.

Costs: It is up to the (aircraft) operator to provide a reasonable estimation of the costs involved. Only costs which are additional to those applicable for the alternative scenario should be taken into account. The MRR also requires that the equipment costs are to be assessed using a depreciation period appropriate for the economic lifetime of the equipment. Thus, the annual costs during the lifetime rather than the total equipment costs are to be used in the assessment.

⁸⁹ See footnote 86.



Example (applicable for stationary installations): An old measuring instrument is found to not function properly any more, and is to be exchanged for a new one. The old instrument has allowed reaching an uncertainty of 3% corresponding to tier 2 ($\pm 5\%$) for activity data. Because the operator would have to apply a higher tier anyway, he considers whether a better instrument would incur unreasonable costs. Instrument A costs 40 000 € and leads to an uncertainty of 2.8% (still tier 2), instrument B costs 70 000 €, but allows an uncertainty of 2.1% (tier 3, $\pm 2.5\%$). Due to the rough environment in the installation, a depreciation period of 5 years is considered appropriate.

The costs to be taken into account for the assessment of unreasonable costs are 30 000 € (i.e. the difference between the two meters) divided by 5 years, i.e. 6 000 €. No cost for the working time should be considered, as the same workload is assumed to be necessary independent from the type of the meter to be installed. Also same maintenance costs can be assumed as approximation.

Benefit: As the benefit of e.g. more precise metering is difficult to express in financial values, an assumption is to be made following the MRR. The benefit is considered to be proportionate to an amount of allowances in the order of magnitude of the reduced uncertainty. In order to make this estimation independent from daily price fluctuations, the MRR requires a constant allowance price of 20 € to be applied. For determining the assumed benefit, this allowance price is to be multiplied by an “improvement factor”, which is the improvement of uncertainty multiplied by the average annual emissions caused by the respective source stream⁹⁰ over the three most recent years⁹¹. The improvement of uncertainty is the difference between the uncertainty currently achieved⁹² and the uncertainty threshold of the tier which would be achieved after the improvement.

Where no direct improvement of the accuracy of emissions data is achieved by an improvement, the improvement factor is always 1%. Article 18(3) of the MRR lists some of such improvements, e.g. switching from default values to analyses, increasing the number of samples analysed, improving the data flow and control system, etc.

Please note the **minimum threshold** introduced by the MRR: Accumulated improvement costs below 2 000 € per year are always considered reasonable, without assessing the benefit.

Summarizing the above by means of a formula, the costs are considered reasonable, if:

$$C < P \cdot AEm \cdot (U_{curr} - U_{new\ tier}) \quad (9)$$

Where:

⁹⁰ Where one measuring instrument is used for several source streams, such as a weighbridge, the sum of emissions of all related source streams should be used.

⁹¹ Only the fossil emissions are considered. Where the most average emissions of the most recent three years are not available or not applicable due to technical changes, a conservative estimate is to be used.

⁹² Please note that the “real” uncertainty is meant here and not uncertainty threshold of the tier.

C Costs [€/year]
 P specified allowance price = 20 € / t CO_{2(e)}
 AEm Average emissions from related source stream(s) [t CO_{2(e)}/year]
 U_{curr} Current uncertainty (not the tier) [%]
 $U_{new\ tier}$ Uncertainty threshold of the new tier that can be reached [%]



Example: For the replacement of meters described above, the benefit of “improvement” for instrument A is zero, as it is a mere replacement maintaining the current tier. It cannot be unreasonable, as the installation cannot be operated without at least this instrument.

In case of instrument B, tier 3 (threshold uncertainty = 2.5 %) can be reached. Thus, the uncertainty improvement is $U_{curr} - U_{new\ tier} = 2.8\% - 2.5\% = 0.3\%$.

The average annual emissions are $AEm = 120\ 000$ t CO₂/year. Therefore, the assumed benefit is $0.003 \cdot 120\ 000 \cdot 20\ € = 7\ 200\ €$. This is higher than the assumed costs (see above). It is therefore not unreasonable to require instrument B installed.

7.3 Annex III: Uncertainty

Note: This section of the annex is included in this guidance only for completeness reasons. It explains the concept of uncertainty, which is not as important for aircraft operators as for operators of stationary installations in the EU ETS. It is taken from guidance document No. 1.

When somebody would like to ask the basic question about the quality of the MRV system of any emission trading system, he would probably ask: “How good is the data?” or rather “Can we trust the measurements which produce the emission data?” When determining the quality of measurements, international standards refer to the quantity of “uncertainty”. This concept needs some explanation.

There are different terms frequently used in a similar way as uncertainty. However, these are not synonyms, but have their own defined meaning (see also illustration in Figure 6):

- **Accuracy:** This means closeness of agreement between a measured value and the true value of a quantity. If a measurement is accurate, the average of the measurement results is close to the “true” value (which may be e.g. the nominal value of a certified standard material⁹³). If a measurement is not accurate, this can sometimes be due to a systematic error. Often this can be overcome by calibrating and adjustment of instruments.
- **Precision:** This describes the closeness of results of measurements of the same measured quantity under the same conditions, i.e. the same thing is measured several times. It is often quantified as the standard deviation of

⁹³ Also a standard material, such as e.g. a copy of the kilogram prototype, disposes of an uncertainty due to the production process. Usually this uncertainty will be small compared to the uncertainties later down in its use.

the values around the average. It reflects the fact that all measurements include a random error, which can be reduced, but not completely eliminated.

- **Uncertainty**⁹⁴: This term characterizes the range within which the true value is expected to lie with a specified level of confidence. It is the overarching concept which combines precision and assumed accuracy. As shown in Figure 6, measurements can be accurate, but imprecise, or vice versa. The ideal situation is precise and accurate.

If a laboratory assesses and optimizes its methods, it usually has an interest in distinguishing accuracy and precision, as this leads the way to identification of errors and mistakes. It can show such diverse reasons for errors such as the need for maintenance or calibration of instruments, or for better training of staff. However, the final user of the measurement result (in the case of the ETS, this is the operator and the competent authority) simply wants to know how big the interval is (measured average \pm uncertainty), within which the true value is probably found.

In the EU ETS, only one value is given for the emissions in the annual emissions report. Only one value is entered in the verified emissions table of the registry. The (aircraft) operator can't surrender " $N \pm x\%$ " allowances, but only the precise value N . It is therefore clear that it is in everybody's interest to quantify and reduce the uncertainty " x " as far as possible. This is the reason why monitoring plans must be approved by the competent authority, and why (aircraft) operators have to demonstrate compliance with specific tiers, which are related to permissible uncertainties.

The uncertainty analysis which is to be added to the monitoring plan (only for installations) as supporting document (Article 12(1) of the MRR) is discussed in section 6.4. For more details, a separate guidance document on the assessment of uncertainty in the EU ETS is provided (Guidance document No. 4, see section 2.3).



⁹⁴ The MRR defines in Article 3(6): 'uncertainty' means a parameter, associated with the result of the determination of a quantity, that characterises the dispersion of the values that could reasonably be attributed to the particular quantity, including the effects of systematic as well as of random factors, expressed in per cent, and describes a confidence interval around the mean value comprising 95% of inferred values taking into account any asymmetry of the distribution of values.

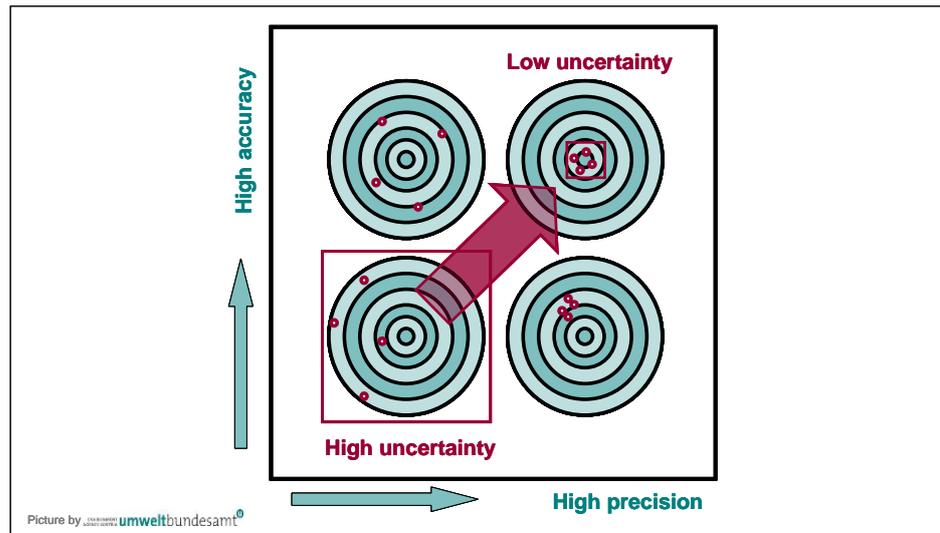


Figure 6: Illustration of the concepts accuracy, precision and uncertainty. The bull's eye represents the assumed true value, the "shots" represent measurement results.



Example: An aircraft operator is operating five aircraft and 500 flights each per year resulting in 2,500 total fuel uplifts in one year. Method A is used for the determination of the fuel consumed.

$$F_N = T_N - T_{N+1} + Up_{N+1}$$

where:

$F_{N,A}$ Fuel consumed for the flight under consideration (=flight N) determined using method A [t]

T_N Amount of fuel contained in aircraft tanks once fuel uplift for the flight under consideration (=flight N) is complete [t]

T_{N+1} Amount of fuel contained in aircraft tanks once fuel uplift for the subsequent flight (=flight N+1) is complete [t]

Up_{N+1} ... Fuel uplift for the subsequent flight (=flight N+1) [t]

The total amount of fuel consumed over the year is then simply the sum of all F_N . Assuming that all flights are covered by the ETS, i.e. all flights start or end within the EU, only the fuel contained in the aircraft tank before the first flight and after the last flight are relevant. All other readings in between are mutually cancelled out:

$$\sum_{N=1}^{2500} F_N = \sum_{N=1}^{2500} (T_N - T_{N+1} + Up_{N+1}) = T_1 - T_{2500} + \sum_{N=1}^{2500} Up_{N+1}$$

The amount of fuel contained in the tank and all uplifts will usually be determined by volumetric flow meters. Therefore, each uplift has to be converted into mass amounts by multiplying with the density of the fuel:

$$T_{(\text{tonnes})} = T_{(\text{Volume})} \cdot \rho \quad Up_{(\text{tonnes})} = Up_{(\text{Volume})} \cdot \rho$$

where:

ρ (actual) density of the fuel

It is assumed that the uncertainty related to the determination of the density is $\pm 3\%$ and that the uncertainty related to the volume of the uplift is $\pm 0.5\%$. The (relative) uncertainty u of the mass of each uplift can be determined as the uncorrelated (i.e. independent) uncertainty of a product⁹⁵:

$$u_{Up,tonnes} = \sqrt{u_{Up,Volume}^2 + u_{density}^2} = \sqrt{0.5\%^2 + 3\%^2} = 3.04\%$$

The relative uncertainty related to the total amount of fuel consumed over the year can be calculated as an uncorrelated (independent) uncertainty of a sum⁹⁵:

$$u_{fuel(year)} = \frac{\sqrt{(U_{T,1})^2 + (U_{T,2500})^2 + (U_{Up,1})^2 + \dots + (U_{Up,2500})^2}}{|T_1 - T_{2500} + Up_1 + \dots + Up_{2500}|}$$

where:

U absolute uncertainty of the parameter in index

u relative uncertainty of the parameter in index

It is assumed that the uncertainty related to the tank level reading is $\pm 0.1\text{m}^3$ and that the amount contained in the tank after each uplift is approximately the same amount, e.g. 8m^3 . In this example the related uncertainty would be $u_T = 1.25\%$. Therefore, the uncertainty related to the tank level reading is small compared to the uncertainty related to the fuel uplift uncertainty. This simplifies the determination of the relative uncertainty related to the total amount of fuel consumed over the year:

$$u_{fuel(year)} = \frac{\sqrt{2 \cdot (U_{T,1})^2 + 2500 \cdot (U_{Up,1})^2}}{|2500 \cdot Up_1|} \approx \frac{\sqrt{2500 \cdot (U_{Up,1})^2}}{|2500 \cdot Up_1|} = \frac{1}{50} \cdot u_{Up,1}$$

$$u_{fuel(year)} = \frac{1}{50} \cdot u_{Up} = \frac{1}{50} \cdot 3.04\% = 0.06\%$$

It can be seen clearly that the more uplifts happen during the year, the lower is the overall uncertainty related to the total amount of fuel consumed. Under the assumption that each uplift is about the same amount having equal uncertainty, the overall (relative) uncertainty is calculated by dividing the (relative) uncertainty of a single uplift by the square root of the total number of uplifts in this year.

Furthermore you may note that the absolute values of the fuel uplifts, the density of the fuel or the size of an aircraft's fuel tank are of no relevance for the determination of the overall (relative) uncertainty under the given assumptions.

It also needs to be noted that the uncertainty related to the tank level readings may not be negligible if many flights of the same aircraft are carried out outside the EU ETS, i.e. neither starting nor landing within the EU.

⁹⁵ For further information please see Annex III of Guidance Document 4 on Uncertainty.

7.4 Annex IV: Acronyms

EU ETS.....	EU Emission Trading System
CH ETS.....	Swiss Emission Trading System
UK ETS.....	UK Emission Trading System
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
ICAO	International Civil Aviation Organisation
MRV	Monitoring, Reporting and Verification
MRR.....	Monitoring and Reporting Regulation (M&R Regulation)
AVR	Accreditation and Verification Regulation (A&V Regulation)
MP	Monitoring Plan
CA	Competent Authority
AER	Annual Emissions Report
MS	Member State(s); In this guidance always meaning “EEA state”, i.e. “EU Member State or EFTA State”
EEA.....	European Economic Area (covers EU and EFTA countries)
EFTA.....	European Free Trade Association (members: Norway, Iceland, Liechtenstein, Switzerland; The latter does not participate in the EU ETS)
CRCO	Eurocontrol’s Central Route Charges Office
SET.....	Small Emitter Tool (Eurocontrol)
ETS-SF	ETS Support Facility (Eurocontrol)

7.5 Annex V: Legislative texts

EU ETS Directive: Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, amended several times, e.g. by Directive 2009/29/EC in order to prepare the third EU ETS phase, and by Regulation (EU) 421/2014 regarding the scope for aviation activities, and simplifications for certain small emitters. Download of the consolidated version:

<http://data.europa.eu/eli/dir/2003/87/2020-01-01>

Implementation of CORSIA in the EU: Commission Delegated Regulation (EU) 2019/1603 of 18 July 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council as regards measures adopted by the International Civil Aviation Organisation for the monitoring, reporting and verification of aviation emissions for the purpose of implementing a global market-based measure Download under: http://data.europa.eu/eli/reg_del/2019/1603/oj

M&R Regulation: Commission Implementing Regulation (EU) No. 2066/2018 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No. 601/2012. Download under: http://data.europa.eu/eli/reg_impl/2018/2066/oj and latest amendment under: http://data.europa.eu/eli/reg_impl/2020/2085/oj

A&V Regulation: Commission Implementing Regulation (EU) 2018/2067 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council Download under: http://data.europa.eu/eli/reg_impl/2018/2067/2021-01-01

RES Directive: Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Download: <http://eur-lex.europa.eu/eli/dir/2009/28/>

RED II: Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast). Download under: <http://data.europa.eu/eli/dir/2018/2001/oj>

Swiss Linking agreement: Agreement between the European Union and the Swiss Confederation on the linking of their greenhouse gas emissions trading systems Download under: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02017A1207%2801%29-20201105>

EEA agreement: Inclusion of the EU ETS for Aviation in the EEA agreement: Decision of the EEA Joint Committee No 6/2011 of 1 April 2011 amending Annex XX (Environment) to the EEA Agreement: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:093:0035:0037:EN:PDF>

Scope guidance: Commission Decision 2009/450/EC of 8 June 2009 on the detailed interpretation of the aviation activities listed in Annex I to Directive 2003/87/EC of the European Parliament and of the Council: <http://data.europa.eu/eli/dec/2009/450/oj>

Commission's list of aircraft operators: For the latest Regulation see: https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en