ETC CM Report 2023/03

Greenhouse gas intensities of transport fuels in the EU in 2021

Monitoring under the Fuel Quality Directive

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Executive summary

About this report

This report provides a summary of the information on the greenhouse gas (GHG) emission intensity of fuels supplied for road transport and non-road mobile machinery in the European Union (EU) in 2021, as reported by EU Member States, Northern Ireland[(1)], Iceland and Norway[(2)] under Art. 7a of Directive 98/70/EC[(3)] relating to the quality of petrol and diesel fuels (the Fuel Quality Directive, FQD).

Article 7a of the Fuel Quality Directive sets out reporting requirements concerning the volume and type of fuels (including fossil fuels, other non-biofuels and biofuels) supplied for road transport and non-road mobile machinery as well as their life cycle greenhouse gas (GHG) emissions (taking into account their extraction, processing and distribution). This approach also considers the emissions resulting from indirect land use change (ILUC) for biofuels. The FQD sets a reduction target for fuel suppliers to reduce the GHG intensity of transport fuels (life cycle GHG emissions per unit of energy from fuel and energy supplied) by a minimum of 6% by 2020 as compared to 2010 levels and to ensure that suppliers respect the target of 6% after the year 2020. Member States must also analyse the share of biofuels in the total amount of fuels consumed for the purposes falling within the scope of the FQD.

The EEA supports the European Commission in the compilation, quality checking and dissemination of information reported under Article 7a of the FQD.

Main findings

Fuel suppliers are not sufficiently reducing the GHG intensity of fuels supplied in the EU

According to the data reported in 2022 by the 27 Member States, the average GHG intensity of the fuels[(4)] supplied in these countries in 2021 (excluding the ILUC emissions intensity for biofuels) was 89 g carbon dioxide equivalent (CO_2e), 5.5% lower than the 2010 levels. This is a slight improvement (0.03 percentage points) compared to the year 2020. It also represents an additional reduction of 1.2 percentage points compared to 2019 (4.3% reduction compared to 2010, for 28 EU Member States) and of 1.8 percentage points compared to 2018 (3.7% reduction compared to 2010, for 28 EU Member States). Therefore, in 2021, EU fuel suppliers in the 27 reporting Member States were, on average, behind their objective of reducing the GHG intensity of transport fuels by 6% compared to 2010[(5)]. In order to reach the obligatory 6%, target, an additional 0.5% reduction in the GHG intensity of all fossil fuels, biofuels and electricity supplied would have been needed.

The progress achieved by fuel suppliers varies greatly across Member States. Fuel suppliers from thirteen countries exceeded the 6% reduction target in 2021. Two Member States reached the 2020 target for the first time in 2021, namely Netherlands and Slovakia, with GHG emission intensity reductions of 6.3% and 6% respectively.

(1) See the Northern Ireland Withdrawal Agreement to be found here https://eur-lex.europa.eu/eli/treaty/withd_2020/2022-02-22

(2) Iceland and Norway have no reporting obligation and submit information on a voluntary basis.

(3) Directive 98/70/EC of the European Parliament and of the council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC.

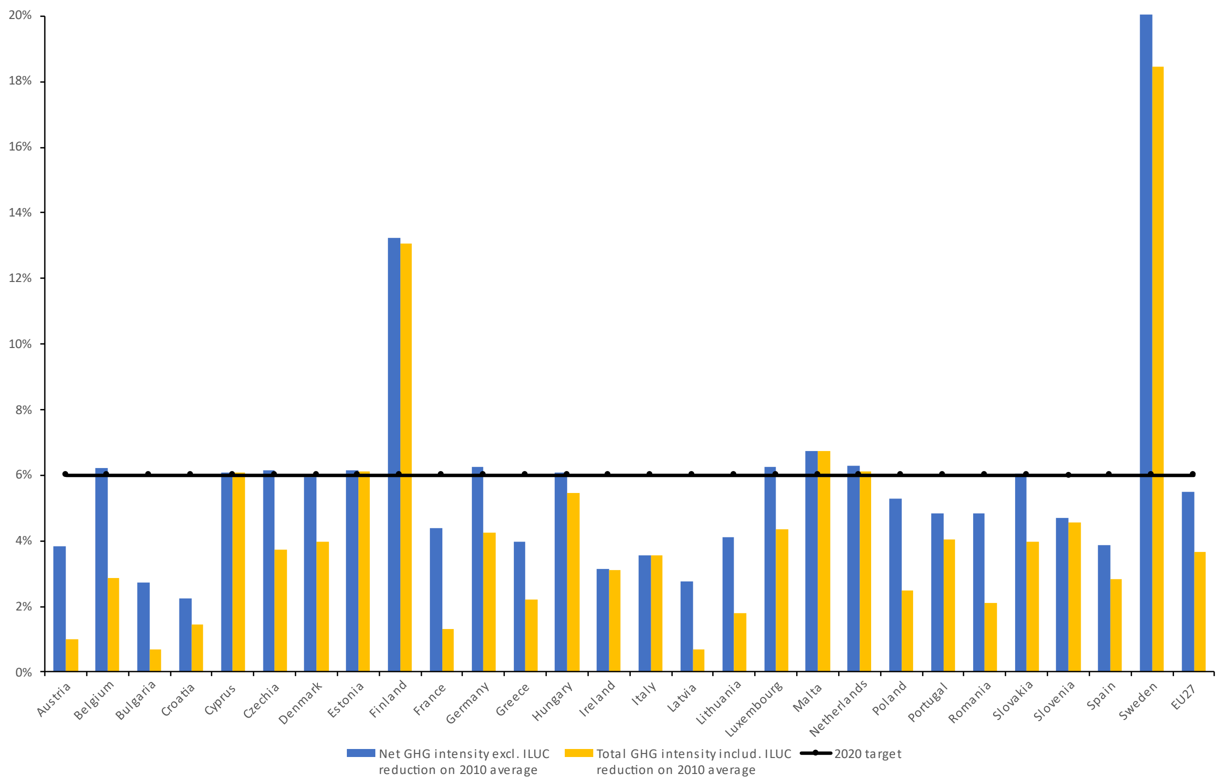
(4) Considering the electricity consumed that was voluntarily reported by 16 Member States.

(5) In 2021, upstream emission reductions were reported by fifteen Member States, which are expected to contribute to the 6% reduction target.

From the Member States that have not yet reached the 2020 target, the most significant progress was made by Portugal, which reduced its GHG emission intensity by 1.4% compared to 2020, with an overall reduction of 4.85% compared to 2010. From these Member States, seven have reported reductions greater than 4%, while for the remaining Member States the reductions remain lower than 4%.

Direct land-use change (DLUC) emissions result from the conversion of non-agricultural land, such as forests, into agricultural land to grow biofuels or to displace food production (grazing land) resulting from biofuel production. Indirect land-use change (ILUC) emissions result from the expansion of cropland for production of displaced agricultural (food/feed) products induced by feedstock growth for biofuel production. As biofuels production increased since 2010, taking these ILUC emissions into account results in lower reductions of the GHG intensity of fuels. The average GHG intensity of the fuels consumed in 2021 was only 3.7% lower than the 2010 levels when considering ILUC – this corresponds to a saving of 40 Mt CO2e in the year 2021. When ILUC emissions are considered, it should be noted that there is wide disparity per Member State to the type of feedstocks used to produce biofuels that are consumed in their national territories; this constitutes a key factor in the performance of each Member State towards meeting the target, see Figure 1.1.

Figure ES-1 Reductions in GHG intensity of fuels achieved by EU fuel suppliers in Member States, 2010-2021



Note: The 2020 target of 6% refers to GHG intensity reduction excluding ILUC

Source: EEA

Diesel and biodiesel dominate fossil fuel and biofuel supply

The total fuel supply of transport in 2021 for the 27 MS was 11 592 petajoules of which 93.3% came from fossil fuels and 6.7% from biofuels. The fuel supply was dominated by diesel (56.4%) and petrol (22.7%), followed by gas oil (12.7%), biodiesel (FAME) (4.1%), HVO (1.3%) and bioethanol (0.9%).

Regarding the main feedstock and pathways used to produce biofuels, biodiesel is produced mainly from rapeseed (42%), used cooking oil (22.8%) and palm oil (13.3%); bioethanol is produced mainly from corn (54.3%), wheat (15.3%) and other cereals (6.5%); and HVO is produced mainly from palm oil (34.1%), tallow (17.4%) and palm fatty acid distillate (PFAD) (11.2%).

In addition to the reporting on fossil fuels and biofuels, fuel suppliers may also voluntarily report on the quantity of electricity consumed by electric vehicles and motorcycles. In 2021, this quantity accounted for 0.04% of the total energy supply, as reported by 16 Member States.

ILUC and effects of substitution by biofuels on GHG intensities

The biofuel feedstock is important when assessing the GHG reduction potential of biofuels, especially when including the ILUC effect.

For biodiesel, a substantial part (above 63% of the total quantities reported) is produced from oil crops, which have a high GHG intensity compared to other feedstocks, particularly when ILUC default reporting values are included[6]. When considering ILUC, biodiesel from oil crops appears to be only marginally better in terms of life cycle GHG emission than fossil diesel fuel (85.0 vs 95.1 g CO2e/MJ).

In the case of HVO, the majority (68%) is produced from other feedstocks, such as tallow, PFAD, waste oils and fats, which generally have lower GHG intensity. When considering ILUC, the HVO produced from these feedstocks has a GHG intensity that is significantly lower than that of diesel (7.9 vs 95.1 g CO2e/MJ). The quantities of HVO produced from oil crops (featuring therefore a significantly higher GHG intensity), are lower (around 32%).

Bioethanol is mainly produced from cereals and other starch-rich crops (around 78% of the total quantities reported) and other feedstocks (around 13%), such as tallow, PFAD, waste oils and fats. When considering ILUC, the average GHG intensity of bioethanol increases, however it still remains significantly lower than that of fossil petrol (30.7 vs 93.3 g CO2e/MJ).

Substitution of diesel with biodiesel and HVO results in GHG emission reductions of approximately 46%, when considering ILUC, and nearly 78% when excluding ILUC. Substitution of petrol with bioethanol and bio-ethyl tert-butyl ether (bio-ETBE) leads to reductions of around 66% when considering ILUC, and nearly 78% when excluding ILUC. Finally, substitution of compressed natural gas with biogas leads to reductions of around 81% and 82% respectively.

[6] Annex V, Part A. Provisional estimated ILUC emissions from biofuels of Directive (EU) 2015/1513 of the European Parliament and of the council of 9 September 2015.

1 Introduction

The role of fuels and their contribution to decreasing air pollution and GHG emissions has been recognized in EU legislation, which has stipulated minimum quality requirements and GHG intensity reduction targets for a range of petroleum and bio-based fuels. The reduction targets are likely to be achieved with the use of sustainable biofuels, electricity consumed by electric vehicles, fossil fuels with lower carbon-intensity, renewable fuels of non-biological origin (RFNBOs), while the reduction of upstream GHGs emitted during the crude oil production phase can also potentially play an important role.

EU Member States report annually information on the volumes, energy content and life cycle GHG emissions of fuels used in road transport and non-road mobile machinery, in line with their obligations under the Fuel Quality Directive 98/70/EC (FQD) Article 7a.

The reporting on data pursuant to Article 7a applied for the first time in 2018 in relation to the year 2017, following the application and transposition of Council Directive (EU) 2015/652.

The key documents that lay out the official requirements for the quality and GHG intensity of fuels sold in the EU, as well as the monitoring and reporting obligations for Article 7a, are the following:

- Directive 98/70/EC of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC;
- Directive 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels;
- Directive 2009/30/EC of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC; the Directive introduces Article 7a on GHG emission reductions;
- Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources (Renewable Energy Directive RED) defines, like the FQD, the sustainability criteria for biofuels (Article 17); in addition, it defines the lower calorific values to be used for biofuels (Annex III) and the default GHG emissions for biofuels not fulfilling the sustainability criteria (Annex V D). RED has been later amended by Directive (EU) 2018/2001 (RED II), detailing the respective provisions for the 2020 – 2030 period.

This report summarises the information reported by the EU Member States and subsequently collected, checked and compiled by the EEA on the volume, energy consumption, and GHG intensity of fossil fuels and biofuels.

Chapter 2 describes the reporting requirements and the summary format for each Member State's submission under FQD Article 7a.

Chapter 3 provides an overview of the Article 7a reported information aggregated at EU level.

Chapter 4 summarises the progress with respect to the 2020 targets under the Fuel Quality Directive, whereas Chapter 0 discusses the effects of ILUC on GHG intensities.

Chapter 6 compares the information provided under Article 7a with other sources.

2 Reporting by European Union Member States

2.1 Reporting requirements

The information provided by the Member States under Article 7a comprises the following aspects:

1. fossil fuels and other non-biofuels information: possible data confidentiality issues, fuel or energy type, raw material source and process, fuel quantity supplied, energy quantity supplied and greenhouse gas (GHG) intensity;

2. biofuels information: possible data confidentiality issues, biofuel or energy type, sustainability of biofuel, feedstock used, biofuel production pathway, biofuel quantity supplied, energy quantity supplied, GHG intensity and indirect land use change (ILUC) feedstock category and emissions intensity;

3. information on electricity consumed by electric vehicles and motorcycles, on a voluntary basis: energy quantity, including and excluding the powertrain efficiency and the GHG intensity.

An Excel template is used by EU Member States for their reporting obligations under Article 7a of the FQD(7). Its purpose is to provide the necessary information and guidance for the preparation of national reports and to ensure that all the required information has been provided.

The information provided by the Member States over the years is partly(8) accessible in EEA's [Central Data Repository](http://cdr.eionet.europa.eu).

2.2 Quality of Member States' reporting in 2021

The EEA is responsible for the collection, quality assurance/quality control (QA/QC) and compilation of the data submitted at EU level and is supported in these tasks by the European Topic Centre on Climate change mitigation (ETC CM)(9).

In 2022, in relation to reference year 2021, 27 EU Member States plus Northern Ireland(10), Iceland and Norway submitted their fuel quality reports in accordance with the requirements of the FQD. During the QA/QC procedure, the ETC CM reviewers posed clarifying questions to the reporting countries, relating to the completeness and consistency of their submitted data sets. The most common findings communicated to the countries following the quality checks performed on the information reported were:

- data reported not corresponding to the data lists provided in the template;
- wrong entries inserted in the report;
- missing information, mainly on feedstock and/or production pathway;
- data reported in aggregated form.

(7) http://cdr.eionet.europa.eu/help/fqd

(8) Due to the confidentiality of the data, some MS choose not to give public access to the data.

(9) The ETC CM is a consortium of European organizations contracted by the EEA to carry out specific tasks identified in the EEA strategy in the area of climate change mitigation.

(10) See the Northern Ireland Withdrawal Agreement to be found here https://eur-lex.europa.eu/eli/treaty/withd_2020/2022-02-22

Most of these issues could be solved directly with the Member States in the communication process, by their completing missing information, correcting erroneous values or providing the necessary clarifications. Following the QA/QC procedure, 3 Member States submitted revised data sets, while 6 Member States provided clarifications on their reported values. The last **resubmission** was received on the 20.02.2023 and the last **first** submission was received on 15.03.2023.

3 Supplied quantities of road transport fuels in 2021

3.1 Fossil fuel and biofuel quantities supplied

Fuel suppliers must report annually to the authority designated by the Member State on the greenhouse gas (GHG) intensity of fuel and energy supplied within each Member State by providing as a minimum the total volume or quantity of each type of fuel or energy supplied and the associated life cycle GHG emissions per unit of energy.

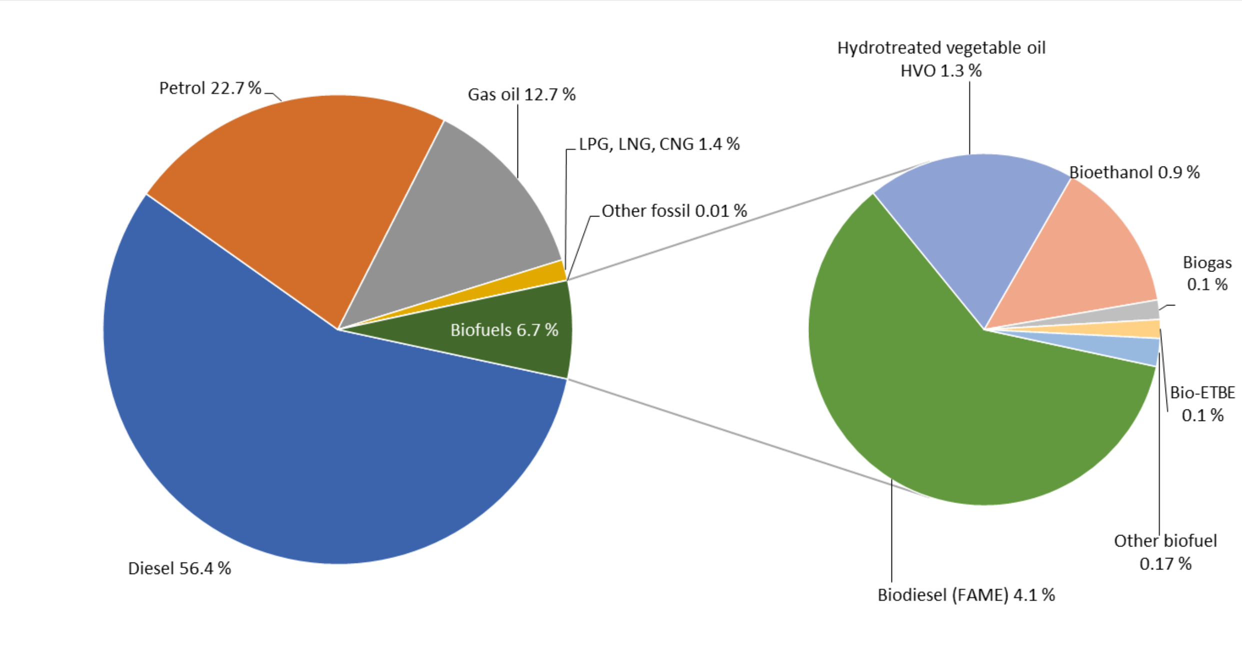
The total energy quantities supplied by suppliers are presented in Table 3-1 for the different fossil fuels and biofuels marketed in the 27 Member States.

Table 3-1 Total quantities of fossil fuels and biofuels

	Total quantity (PJ)
Fossil fuels	10 810
Diesel	6 543
Petrol	2 629
Gas oil	1 472
Liquid petroleum gas (LPG)	128
Compressed natural gas (CNG)	18
Liquefied natural gas (LNG)	19
Other	1
Biofuels	781
Biodiesel	475
Hydrotreated vegetable oil (HVO)	150
Bioethanol	109
Biogas	14
Bio-ETBE	13
Other	20

Total fuel supply reported was 11 592 petajoules (PJ), of which 93.3% was from fossil fuels, and 6.7% was from biofuels (Figure 3-1). No renewable fuels of non-biological origin were reported for reference year 2021.

Figure 3-1 **Fuel energy supply shares per fuel type in 2020**



Notes: In category "other biofuel" the following types are included: Biomethane, Hydrotreated oil – Diesel, Bionaphtha, Biopetrol, Hydrotreated oil – Gasoline, Bio-LPG, Biofuel oil, cracked HVO for gasoline, Biokerosine, co-processed HVO, Biopropane, Biomethanol, hydrocarbons from co-hydrogenation from rapeseed oil, Bio-MTBE (methyl tert-butyl ether), Bio-LNG, pure vegetable oil, FAEE (fatty acid ethyl esters), bioethanol diesel, co-treated oil for diesel.

The fossil fuel supply in 2021 was dominated by diesel (56.4% of total fuel consumption; 6 543 PJ[(11)]), followed by petrol (22.7% of total fuel consumption; 2 629 PJ) and gas oil (12.7% of total fuel consumption; 1 472 PJ). Liquified petroleum gas (LPG), liquified natural gas (LNG) and compressed natural gas (CNG) had a total share of 1.4% (165 PJ) in the total fuel consumption.

The biofuels energy consumption in the 27 EU Member States is dominated by biodiesel (Fatty acid methyl esters – FAME) (4.1% of total fuel consumption; 475 PJ), followed by hydrotreated vegetable oil (HVO; 1.3% of total fuel consumption; 150 PJ) and bioethanol (0.9% of total fuel consumption; 109 PJ). Bio-ETBE and biogas account for 0.2% (27 PJ) of the total fuel consumption. All other biofuels used in road transport and non-road mobile machinery in 2021 present a share of 0.2% (20 PJ) in the total fuel consumption (Figure 3-1).

3.2 Biofuel production pathways and feedstocks used

Member States must report on the feedstock and the biofuel production pathway used for each of the biofuels consumed in their territories. Feedstock is relevant for estimating the potential indirect land use change (ILUC), whereas the biofuel production pathways are relevant for calculating the GHG intensity of the produced fuels and the potential emissions savings from their use.

Feedstocks used for biofuel production may be derived from plants grown directly for the purpose of energy production, or from plant parts, processing wastes, residues and materials from human and animal

(11) A petajoule (PJ) is equal to one thousand terajoules (TJ) or one million gigajoules (GJ) or one billion megajoules (MJ).

activities. In relation to the feedstock used, different production pathways may be followed to develop the final biofuels that are available in the market. Hence, feedstocks refer to the origin and to the raw material source of the biofuel while production pathways refer to the different processes used for the production of the biofuel always relevant to the respective feedstock.

The main feedstocks and production pathways for the three main categories of biofuels, as these have been reported by the 27 Member States, are summarised in Table 3-2 below. The share of undefined production pathways, reported as (N/A), largely explains the differences in the shares of the different feedstocks and pathways. Any remaining differences are due to the shares reported as "Other" by the Member States.

Table 3-2 Summary of main feedstock and production pathways by biofuel

Biodiesel	Feedstock	Pathway
Rapeseed	42.1%	34.6%
Used cooking oil / waste vegetable oil or animal fat	27.9%	38.6%
Palm oil	13.3%	6.0%
Other	21.8%	34.2%
N/A	0.19%	23.2%
Bioethanol	**Feedstock**	**Pathway**
Corn (maize)	54.3%	25.7%
Wheat	15.4%	12.5%
Other cereals	6.5%	4.1%
Other	23.5%	18.9%
N/A	0.32%	38.8%
Hydrotreated vegetable oil	**Feedstock**	**Pathway**
Palm oil	34.1%	15.4%
Tallow / tall oil pitch	24.5%	5.1%
Palm fatty acid distillate (PFAD)	11.2%	15.8%
Other	37.3%	13.4%
N/A	0.00%	50.3%

Feedstocks

- The main types of feedstock used to produce **biodiesel** (4.1% of total fuel consumption) are rapeseed (42.1%), used cooking oil and waste vegetable oil or animal fat (27.9%) and palm oil (13.3%). These feedstocks account for about 83.4% of the total biodiesel quantities supplied to the 27 Member States.
- **Bioethanol** (0.9% of total fuel consumption) is mainly produced from corn (maize, 54.3%), wheat (15.4%) and other cereals (6.5%). These feedstocks account for about 76.2% of the total bioethanol quantities supplied to the 27 Member States.
- For **HVO** (1.3% of total fuel consumption) production, palm oil accounts for 34.1%, tallow and tall oil pitch for 24.5% and palm fatty acid distillate (PFAD) for 11.2%. These feedstocks account for about 69.9% of the total HVO quantities supplied to the 27 Member States.

Production pathways

- **Biodiesel** is derived mainly from four production pathways: pathways utilising rapeseed (34.6%), used cooking oil and waste vegetable oil or animal fat biodiesel (38.6%), palm oil biodiesel (6.0%) and soybean biodiesel (8.3%). These pathways account for the production of about 87.5% of the total biodiesel quantities supplied to the 27 Member States. There is also a substantial share of 23.2% for which the production pathway of biodiesel has not been defined by the reporting Member States. This incomplete reporting also explains the discrepancies between the different production pathways and the respective values of the considered feedstocks indicated above.

- For the production of **bioethanol**, pathways utilising corn ethanol (25.7%) is the most common pathway, followed by pathways utilising wheat (12.5%, of which 11.1% comes from non specified processes), and other cereals (4.1%). These pathways account for the production of about 42.3% of the total bioethanol quantities supplied to the 27 Member States. There is also a substantial share of 38.8% of the supplied bioethanol quantities for which the production pathway has not been defined by the reporting Member States. Similar to biodiesel, this share explains the differences between feedstocks used and production pathways.
- **HVO** originates mainly from pathways utilising PFAD (15.8%), palm oil (15.4%), tallow (5.1%) and bio-waste (2.8%). These pathways account for the production of about 39.1% of the total HVO quantities supplied to the 27 Member States. There is also a substantial share of 50.3% for which the production pathway of HVO has not been defined by the reporting Member States. Similar to the above cases, this share explains the discrepancies between feedstocks used and production pathways. Comparing these values to the respective values of 2019, where the share of unknown pathways was significantly lower (8%) and palm oil was responsible for 48.3% of the HVO production, it can be assumed that most pathways that were not defined in the reporting of 2021 correspond to palm oil.

3.3 Electricity consumption

The reporting of the quantity of electricity consumed by electric vehicles and motorcycles by fuel suppliers is voluntary, despite the fact that it can be considered for the 6% reduction target. Sixteen countries reported the electricity consumed by electric vehicles and motorcycles(12). As per the Art. 7a requirements, reported consumed electricity is also accompanied by the associated electricity GHG intensity. However, for three of the Member States that reported electricity consumption, the associated GHG intensities of the electricity consumed were either missing (in the case of Croatia no information on GHG intensity was provided), or provisional (in the case of Portugal which did not provide an update on the value to this time), or corresponded to 2020 (in the case of Ireland that did not have the 2021 grid intensity). Lithuania only reported the quantity of electricity that was generated from one RES producer with the corresponding GHG intensity being equal to zero.

In Table 3-3 the energy quantities consumed by electric vehicles, excluding and including powertrain efficiency, are summarized for the thirteen Member States which accurately provided this information. An adjustment factor of 0.4 for powertrain efficiency is assigned to the battery electric powertrain(13). This includes all electric powertrains, without distinguishing between battery electric vehicles and plug-in hybrid electric vehicles. It should be noted that there is an ongoing discussion that is taking place regarding the methodology for calculating the powertrain efficiency(14). The same remark has been also made by Austria, which has provided the same quantity of energy from electricity when including and excluding powertrain efficiency, stating that the adjustment factor has to be applied to the GHG intensity, instead of the energy, in order to present a benefit.

Actual electricity consumption in the different Member States may be larger since it is not a compulsory field under Article 7(a) and is not actually considered towards the target by many Member States albeit it

(12) Namely: Austria, Czechia, Croatia, Estonia, France, Germany, Hungary, Ireland, Italy, Lithuania, Netherlands, Portugal, Slovakia, Slovenia, Spain and Sweden.

(13) Based on Annex I (f) of Council Directive (EU) 2015/652 of 20 April 2015.

(14) https://www.hernieuwbarebrandstoffen.nl/post/error-in-the-calculation-of-the-greenhouse-gas-intensity-of-electricity-in-fqd-and-red

could be[15]. GHG intensities reported by Member States under Article 7a are presented in Table 3-3[16], together with data provided by a study[17] on the average carbon intensity of the electricity consumed at low voltage in the EU in 2019 for comparison purposes.

Table 3-3 Electricity consumed by electric vehicles and motorcycles in 2021 as a reported contribution by fuel suppliers to their GHG reduction target

Member State	Quantity of energy		GHG intensity		
	excluding powertrain efficiency (GJ)	including powertrain efficiency (GJ)	reported by Member State (g CO_2e/MJ)	reported by Member State (g CO_2e/kWh)	2019 study data (g CO2e/kWh)
Austria	178 818	71 527	21.8	78	264
Czechia	2 234	893	177.0	637	564
Estonia	69 148	27 659	114.5	412	472
France	2 853 505	1 141 402	15.8	56.9	98
Germany	4 989 600	1 995 840	147.0	529	422
Hungary	28 065	11 226	58.7	211	338
Italy	310 951	124 380	110.3	397	356
Netherlands	1 236 277	494 511	133.4	480	450
Slovakia	10 158	4 063	13.1	47	346
Slovenia	4 116	1 646	90.7	327	307
Spain	408	1 633	102.1	368	279
Sweden	10 158	4 063	13.1	47	40

Note: Member States data are for 2021 whereas data provided by the study refer to 2019 (shown for comparison purposes).

Spain reported several GHG intensities, accompanied by the respective electricity consumption. The value presented in this Table corresponds to the weighted average of the reported values. Lithuania reported the electricity that was generated exclusively from one RES producer with the corresponding GHG intensity being equal to zero.

The above data on GHG intensity are not directly comparable as individual Member States may have used a calculation methodology different from that used by the respective study[18]. For example, electricity consumed versus electricity generated and/or applied corrections for the effect of cross-border electricity trade may have an impact on the calculated intensities. In addition, the data used in the study for the calculation of the carbon intensity of electricity generation refer to the year 2019 whereas Member States data are for 2021.

(15) Reasons for this unused possibility to reduce GHG intensity are not known. It could be that the GHG intensity of the electricity mix so far does not result to a carbon intensity sufficiently low to reduce GHG emissions of road transport fuels significantly; this however would have to be further investigated in order to be confirmed.

(16) As mentioned above, Austria has reported the same quantity of energy when including and excluding powertrain efficiency. However, in order for the data reported in Table 4.3 to be presented in a consistent manner, the energy quantity was multiplied by the adjustment factor of 0.4 to account for powertrain efficiency.

(17) Quantification of the carbon intensity of electricity produced and used in Europe, 2022, https://doi.org/10.1016/j.apenergy.2021.117901.

(18) As foreseen by Directive 2015/652, Annex I Part 2, Point 6.

4 Progress to 2021 targets under the Fuel Quality Directive

4.1 Average GHG emissions intensity of transport fuels in 2021

The Fuel Quality Directive (FQD) required a reduction in the GHG intensity of transport fuels by a minimum of 6% by 2020 compared with 2010 levels via the suppliers' monitoring mechanism(19) and by an additional optional 4% via reduction technologies and the Clean Development Mechanism of the Kyoto Protocol. The baseline for this reduction is the average GHG intensity of the EU's fuel mix in 2010, which was 94.1 g CO_2/MJ(20). The fuel baseline standard is calculated based on EU average fossil fuel consumption of petrol, diesel, (non-road) gasoil, LPG and CNG.

For each Member State, Table 4-1 shows the GHG emissions from the consumption of all fuels (fossil fuels and biofuels) and electricity used in transport. The average GHG intensity calculated for each Member State, as well as the relative reduction over the 2010 default baseline value are shown in the same table.

The average GHG intensity of the fuels supplied in the 27 EU Member States (excluding ILUC for biofuels) was 88.9 g carbon dioxide equivalent (CO_2e) in 2021. Thus, a reduction of 5.5% was achieved in 2021 compared to 2010. This corresponds to an additional reduction of 1.2 percentage points, compared to 2019 (4.3% reduction compared to 2010, for 28 EU Member States) and 1.8 percentage points compared to 2018 (3.7% reduction compared to 2010, for 28 EU Member States), while there was no significant improvement with respect to 2020 (5.5% reduction compared to 2010, for 27 EU Member States). This can be partly justified by the fact that the GHG intensity reduction target remained unchanged with respect to 2020, thus not providing additional motives for the Member Stated to further reduce their transport fuel GHG intensity. In order to reach the obligatory 6% target, an additional reduction of 0.5 percentage points in the GHG intensity of all fossil fuels and biofuels supplied will be needed on average in the EU(21). Consequently, additional efforts are necessary to meet the 6% target. In 2021, upstream emission reductions (UERs) were reported by fifteen countries (see details in section 4.2), contributing to a further reduction of the GHG intensity of about 0.5% to reach 5.5% in total. It is noted that in 2020 eleven countries reported upstream emission reductions, reducing the GHG intensity by about 0.3%, while in 2019, only two countries had reported upstream emission reductions, reducing the GHG intensity by about 0.2%.

The average GHG intensity, and hence also the relative distance to meet the target, depends on the share and type of fossil fuels and biofuels in the total fuel mix. The highest GHG intensities of all fuels correspond to diesel (95.1 g CO_2e/MJ) and petrol (93.3 g CO_2e/MJ), whereas substitution with bioethanol (20.1 g CO_2e/MJ, excluding ILUC), HVO (12.6 g CO_2e/MJ, excluding ILUC) and biodiesel (23.8 g CO_2e/MJ, excluding ILUC) reduces significantly the overall GHG intensity, providing thus the highest GHG reduction benefits.

The distance to meet the set target varies across Member States from 3.7% (for Croatia) to 0.7% (for Poland).

The two Member States with the **lowest** achievements in reducing their GHG intensities over the 2010 – 2021 period (lower than 3%) are Croatia and Bulgaria (achieving a reduction of only 2.3% and 2.7

(19) For the purposes of Article 7a of the FQD, Member States shall ensure that suppliers use the calculation method set out in Annex I of Directive 2015/652 to determine the GHG intensity of the fuels they supply.

(20) Baseline value for 2010, according to Annex II of the Council Directive (EU) 2015/652.

(21) Determined across the 27 Member States that reported data.

respectively). The main reason for this is the low share of biofuels (3.2% in Croatia, which is the lowest in the entire EU, and 4.6% in Bulgaria), in combination with the relatively high GHG intensity for biofuels in these countries (50.5 g CO_2eq/MJ for Bulgaria, which is the highest in the entire EU, and 19.3 g CO_2eq/MJ for Croatia). In comparison, the average GHG intensity for biofuels in the EU is 20.9 g CO_2eq/MJ, while the average share of biofuels is equal to 6.7%.

Box 1 Northern Ireland

Since 2020 and, the reporting commitments under the Fuel Quality Directive continue to apply only to Northern Ireland (NI) and not the UK as a whole anymore (see Annex 2 of the Withdrawal Agreement). 2021 was the first reporting year for which data was provided. However, the NI data does not influence the distance to target value - it remains at 5.5% percent. In detail, the average GHG intensity of the fuels supplied in NI in 2021 (excl. ILUC emissions) was 90.9 g carbon dioxide equivalent (CO2e), 3.4% lower than the 2010 levels. In order to reach the obligatory 6%, target, an additional 2.6% reduction in the GHG intensity of all fossil fuels, biofuels and electricity supplied would have been needed in NI.

Finland and Sweden have achieved the **highest** reductions in the average GHG intensity of their fuels with 13.2% and 21.6% respectively (excluding ILUC). These two countries have been exceeding the target of 6% since 2018. Eleven more Member States also exceeded the target in 2021, two of them for the first time (Netherlands and Slovakia). Portugal is close to achieving the target, having reported a 4.8% reduction and having made the most significant progress by reducing its GHG emission intensity by 1.4% compared to 2020. Finland has a biofuel share of 15.7% (73.87% of which is HVO that has the lowest GHG intensity among biofuels, 11.36% is bioethanol and 4.0% is biodiesel) while diesel, petrol and gas oil represent 47%, 31% and 20% of the fossil fuel mix respectively. Sweden has the highest biofuel share among all Member States amounting to 24.7% (69% of which is HVO, 16% is biodiesel and 8% is biogas) and diesel and petrol share in the fossil fuel mix are 65% and 34% respectively. The reductions achieved by these two Member States are attributed to the high biofuels share, as well as the low GHG intensity of biofuels used (12.7 g CO_2eq/MJ in Finland and 10.7 g CO_2eq/MJ in Sweden).

Table 4-1 shows wide disparity of performances when ILUC is accounted for across Member States, due to the different type of feedstocks used for the biofuels consumed in each country. Whereas for many Member States the difference with and without ILUC is relatively small (in the order of 1 percentage units), for some other Member States these differences are a significant fraction of their GHG intensity reductions. The performance of Latvia, Bulgaria, Austria and France is considerably reduced by at least 70% when ILUC effects are considered, due to the extensive consumption of oil crops (from 70% of Bulgaria's biofuel feedstock, mainly produced from sunflower seed, up to 86% of Austria's biofuel feedstock, mainly produced from rapeseed) that have the highest GHG intensities among feedstock categories.

Table 4-1 Average GHG emissions intensity reported by fuel suppliers by Member State in 2021 and reductions compared to 2010

Member State	Fossil fuels		Biofuels		Electricity (incl. powertrain efficiency)*	
	Energy consumption (TJ)	GHG emissions (kt)	Energy consumption (TJ)	GHG emissions (kt)	Energy consumption (TJ)	GHG emissions (kt)
Austria	319 380	30 025	18 556	565	178.8	3.89
Belgium	321 266	30 365	31 466	767	0.0	0.00
Bulgaria	116 237	10 869	5 623	284	0.0	0.00
Croatia	93 371	8 810	3 056	59	0.0	0.00
Cyprus	26 797	2 453	1 102	12	0.0	0.00
Czechia	247 554	23 035	16 508	285	0.9	0.16
Denmark	177 897	16 434	11 292	308	0.0	0.00
Estonia	40 935	3 801	2 374	26	27.7	3.17
Finland	160 551	15 167	29 871	378	0.0	0.00
France	1 787 806	169 128	134 851	4 070	1 141.4	18.03
Germany	2 026 799	189 227	139 568	1 990	1 995.8	293.39
Greece	194 141	18 138	9 897	302	0.0	0.00
Hungary	216 278	20 015	12 344	190	11.2	0.66
Ireland	166 197	15 758	7 619	95	91.7	9.22
Italy	1 251 144	118 449	65 880	1 082	124.4	13.72
Latvia	34 845	3 290	1 516	36	0.0	0.00
Lithuania	86 891	8 172	5 454	161	0.0	0.00
Luxembourg	71 484	6 700	5 820	118	0.0	0.00
Malta	6 890	636	384	3	0.0	0.00
Netherlands	380 665	35 794	29 660	433	494.5	65.97
Poland	988 472	91 301	57 026	1 861	0.0	0.00
Portugal	201 963	19 086	14 372	288	25.3	1.51
Romania	298 214	27 808	18 253	533	0.0	0.00
Slovakia	101 188	9 399	6 793	160	70.5	3.27
Slovenia	75 165	7 067	4 164	47	1.6	0.15
Spain	1 177 358	111 240	67 859	1 411	1.6	0.17
Sweden	240 961	22 758	79 058	843	4.1	0.05
EU (27 Member States)	**10 810 451**	**1 014 925**	**780 365**	**16 308**	**3 028**	**395**

Member State	Average fuel GHG intensity (g CO_2e/MJ) (excl. ILUC)	2010-2021 GHG intensity reduction (excl. ILUC) (%)	Average fuel GHG intensity (g CO_2e/MJ) (incl. ILUC)	2010-2021 GHG intensity reduction (incl. ILUC) (%)
Austria	90.5	3.8%	93.1	1.0%
Belgium	88.3	6.2%	91.4	2.9%
Bulgaria	91.5	2.7%	93.5	0.7%
Croatia	92.0	2.3%	92.7	1.4%
Cyprus	88.4	6.1%	88.4	6.1%
Czechia	88.3	6.1%	90.6	3.7%
Denmark	88.5	6.0%	90.4	4.0%
Estonia	88.3	6.2%	88.3	6.1%
Finland	81.6	13.2%	81.8	13.0%
France	90.0	4.4%	92.9	1.3%
Germany	88.2	6.3%	90.1	4.2%
Greece	90.4	4.0%	92.0	2.2%
Hungary	88.4	6.1%	89.0	5.5%
Ireland	91.1	3.1%	91.2	3.1%
Italy	90.7	3.6%	90.7	3.6%
Latvia	91.5	2.8%	93.5	0.7%
Lithuania	90.2	4.1%	92.4	1.8%
Luxembourg	88.2	6.3%	90.0	4.4%
Malta	87.8	6.7%	87.8	6.7%
Netherlands	88.2	6.3%	88.3	6.1%
Poland	89.1	5.3%	91.8	2.5%
Portugal	89.5	4.8%	90.3	4.0%
Romania	89.6	4.8%	92.1	2.1%
Slovakia	88.4	6.0%	90.4	4.0%
Slovenia	89.7	4.7%	89.8	4.5%
Spain	90.5	3.9%	91.4	2.8%
Sweden	73.7	21.6%	76.7	18.4%
EU (27 Member States)	**89.0**	**5.5%**	**90.7**	**3.7%**

Note: * See also chapter 4.3 for HR, PT, LT, IE. For HR and LT, which have reported electricity generation only from RES providers - thus resulting in zero grid intensity, the electricity consumption has been set as zero in Table 5.1

4.2 Upstream emission reductions

Upstream emissions refer to the GHG emissions produced during the extraction, processing, handling and transport of raw material from their original state to the refinery or processing plant gate where the fuel was produced. Upstream emission reductions (UER) are the GHG emissions reductions that can occur prior to the crude oil entering the refinery, during extraction, processing, handling and transport, including reductions of flaring and venting emissions. The UER claimed by a supplier have to be quantified and reported in accordance with the requirements set out in Directive (EU) 2015/652. There are several options for suppliers to reduce the GHG intensity of fuels towards the 2020 reduction target. More detailed information on approaches to quantify, monitor and report on UER can be found in the relevant guidance note[22]. It is noted however, that there is no obligation to use UER as a compliance option for the FQD Article 7a reduction target.

Fifteen out of 27 Member States that have submitted data under Article 7a have claimed UER. These are presented in Table 4-2:

Table 4-2 UERS (kt CO2e) reported by Member States

Member State	UER (kt CO2e)
Austria	239
Croatia	12.1
Cyprus	70.7
Czechia	247.1
Denmark	392.2
Estonia	54.2
Germany	1 828.2
Hungary	416.4
Italy	4.9
Luxembourg	74.5
Malta	13
Poland	1 001.2
Romania	250.2
Slovakia	144
Slovenia	45.7

Overall, the total reported UER was 4 795 kt CO_2e in 2021, contributing an additional 0.5% reduction of the overall fuel GHG intensity from 5.0% to 5.5%.

(22) https://ec.europa.eu/clima/sites/default/files/guidance_note_on_uer_en.pdf

5 Effects of indirect land use change on GHG intensities

5.1 Greenhouse gas emission intensities of crop types

According to Article 23 paragraph 5(f) of the RED[23], fuel suppliers have to report the life cycle greenhouse gas emissions per unit of energy, including the provisional mean[24] values of the estimated ILUC emissions from biofuels to the Member States. ILUC emissions may significantly reduce the GHG benefits from the use of the different biofuels. Depending on the land types converted to cropland because of biofuels production, these GHG savings may be completely cancelled out. Hence, in an encompassing life cycle analysis, the ILUC-related GHG emissions intensity should be added to the GHG intensity directly attributed to the production and transport of biofuels. For the reporting of ILUC emissions, the mean values included in Annex VIII of the RED II are used. However, ILUC emissions are not taken into account for assessing compliance with the obligatory 6% reduction target.

Table 5-1 provides an overview of the energy supplied by the different crops from which biofuels are produced. The default GHG intensities for each crop type are also reported. ILUC emissions related to biofuel consumed were around 20.6 Mt CO_2e in 2021, an amount almost equivalent to the annual total emissions (excluding ILUC) of Hungary. Oil crops were responsible for 93.5% of these ILUC emissions.

Table 5-1 ILUC summary table

Feedstock category	Cereals and other starch-rich crops	Sugars	Oil crops	Other
Quantity of energy supplied (TJ)	98 080	11 764	350 282	318 916
Default ILUC intensity provisional mean[25] values of the estimated ILUC emissions (g CO_2e/MJ)	12	13	55	0
Total ILUC GHG emissions (kt CO_2e)	**1 177**	**153**	**19 266**	**-**

Based on the mean values of the estimated indirect land-use change emissions provided in the RED (see Annex VIII, Directive 2018/2001), and the 2021 data, an average value of 1.8 g CO_2e/MJ is added to the overall GHG intensity of the transport fuel mix that is reported under Article 7a. Adding this value to the average GHG intensity of 88.9 g CO_2e/MJ (without ILUC) of the fuels consumed in the 27 EU Member States as calculated above (Table 5-1), results in an eventual value of 90.7 g CO_2e/MJ (with ILUC). It is noted that the GHG intensity including ILUC decreased in 2021 in comparison to 2020 and 2019 (91.0 g CO2e/MJ in 2020 and 91.6 g CO2e/MJ in 2019) due to the small reduction of the oil crops for the production of biofuels. Nonetheless, if ILUC was included in the calculation of the GHG intensity, the relevant reduction from the baseline (in the year 2010) would be 3.7% as opposed to the 5.5% reduction when excluding ILUC, see Table 4-1.

(23) 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.

(24) For the purposes of Article 7a of the FQD, Member States shall ensure that suppliers use the calculation method set out in Annex I of Directive 2015/652 to determine the GHG intensity of the fuels they supply.

(25) The mean values included here represent a weighted average of the individually modelled feedstock values (Annex VIII, Directive 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).

The overall GHG intensity reduction including ILUC is below 2% for six Member States, while if ILUC was considered, only six out of thirteen Member States would have achieved the 2020 GHG reduction target. Considering ILUC, Finland has the most significant improvement on its performance compared with a reduction of 13% for 2021 (7% in 2020). However, this improvement can be mainly attributed to the increased share of biofuels (15.7% in 2021 and 8.7% in 2020), and not to the feedstock used, since the share of oil crops, which have the highest ILUC emissions, was increased for Finland (0.19% in 2021 and 0% in 2020).

5.2 Greenhouse gas emission savings by substituting fossil fuels with biofuels

In order to estimate the decarbonization potential of biofuels, i.e. the GHG savings that can be achieved from the substitution of their fossil fuel counterparts, data on the actual biofuel use and the respective GHG intensities, as reported by the different EU Member States, are used.

To this aim, GHG emissions from the use of biofuels by different feedstock categories have been calculated with and without ILUC, by using the reported GHG intensities. These emissions are then compared with the calculated GHG emissions from the use of equal quantities — in terms of energy content — of conventional fuels.

The most relevant biofuels for this analysis are biodiesel, bioethanol and HVO, which account for 93.9% of the total biofuel energy consumption in the 27 EU Member States. The relevant data for this comparison is summarised in Table 5-2. The average GHG intensity and corresponding GHG emissions with and without ILUC are presented for the different feedstocks for each of the selected biofuels.

Table 5-2 GHG emissions from the use of biofuels and different feedstocks

	Energy quantity (TJ)				Average GHG intensity (g CO_2e/MJ) Excluding ILUC emissions				Average GHG intensity (g CO_2e/MJ) Including ILUC emissions			
	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021
Biodiesel	**504 122**	**526 806**	**448 671**	**474 655**	**26.4**	**24.6**	**25.2**	**23.8**	**62.6**	**58.9**	**62.6**	**58.2**
Cereals and other starch-rich crops	1	24	134	82	15.3	34.2	24.6	10.6	27.3	46.2	36.6	22.6
Sugars	-	-	-	-	-	-	-	-	-	-	-	-
Oil crops	331 808	329 376	305 585	300 527	33.9	32.2	31.5	30.6	88.9	87.0	86.4	85.0
Other	167 404	197 406	142 945	173 265	11.6	12.0	11.7	11.9	11.6	12.0	11.7	11.9
HVO	**92 899**	**96 298**	**146 018**	**149 683**	**15.6**	**14.0**	**15.3**	**12.6**	**34.0**	**33.3**	**39.3**	**28.7**
Cereals and other starch-rich crops	1 898	48	-	-	10.9	7.6	-	-	22.9	19.6	-	-
Sugars	-	-	-	-	-	-	-	-	-	-	-	-
Oil crops	30 761	33 795	63 892	47 645	30.2	26.4	23.5	22.7	85.2	81.4	78.5	73.2
Other	60 240	62 455	82 084	101 803	8.3	7.3	8.8	7.9	8.3	7.3	8.8	7.9
Bioethanol	**110 523**	**110 866**	**97 089**	**109 311**	**24.3**	**22.6**	**20.7**	**20.1**	**35.8**	**33.9**	**31.6**	**30.7**
Cereals and other starch-rich crops	89 742	87 010	76 536	85 195	23.6	22.5	20.5	20.9	35.6	34.5	32.5	32.9
Sugars	15 439	15 417	10 724	10 120	31.9	26.8	25.0	19.1	44.9	39.8	38.0	32.1
Oil crops	1	5	52	1	34.2	24.6	46.8	30.3	89.2	79.6	101.8	85.3
Other	5 296	8 435	9 775	13 971	12.7	16.4	17.1	16.4	12.7	16.4	17.1	16.4

	GHG emissions (kt CO_2e) Excluding ILUC emissions				GHG emissions (kt CO_2e) Including ILUC emissions			
	2018	2019	2020	2021	2018	2019	2020	2021
Biodiesel	**13 328**	**12 982**	**11 292**	**11 293**	**31 577**	**31 023**	**28 091**	**27 628**
Cereals and other starch-rich crops	0	1	3	1	0	1	5	2
Sugars	-	-	-	-	-	-	-	-
Oil crops	11 256	10 612	9 618	9 203	29 506	28 652	26 415	25 537
Other	1 943	2 369	1 670	2 063	1 943	2 369	1 670	2 063
HVO	**1 449**	**1 348**	**2 229**	**1 890**	**3 164**	**3 207**	**5 743**	**4 294**
Cereals and other starch-rich crops	21	0.4	-	-	44	1	-	-
Sugars	-	-	-	-	-	-	-	-
Oil crops	930	892	1 501	1 083	2 622	2 751	5 015	3 487
Other	498	456	724	800	498	456	724	800
Bioethanol	**2 682**	**2 511**	**2 007**	**2 200**	**3 960**	**3 755**	**3 067**	**3 354**
Cereals and other starch-rich crops	2 120	1 959	1 569	1 777	3 197	3 003	2 488	2 799
Sugars	493	413	268	193	693	613	407	325
Oil crops	0.04	0.1	2	0	0	0	5	0
Other	67	138	167	229	67	138	167	229

Note: Geographical unit is EU28 for 2018/2019 and EU27 for 2020/2021. Estimated ILUC emissions considering the average GHG intensity values of RED and the reported biofuel energy quantities.

The above table shows that the biofuel feedstock is important when assessing the GHG reduction potential of biofuels, especially when ILUC effects are considered.

For biodiesel, a substantial part (above 63% of its total quantity) is produced from oil crops, which have a high GHG intensity compared to other feedstocks suitable for biodiesel production. When considering ILUC, oil crop based biodiesel is only marginally better in terms of life cycle GHG emissions than fossil fuel diesel (85.0 vs 95.1 g CO2e/MJ).

Bioethanol is mainly produced from cereals and other starch-rich crops (around 78%) and other feedstocks (around 13%), such as tallow, PFAD, waste oils and fats. When including ILUC, the average GHG intensity of bioethanol increases; however, it still remains significantly lower than fossil petrol (30.7 vs 93.3 g CO_2e/MJ).

In the case of HVO, the majority is produced from feedstocks with no ILUC value associated (such as tallow, waste oils and fats, around 68%) and with a low GHG intensity, whereas the HVO quantities produced from oil crops, which have a much higher GHG intensity (22.7 g CO2e/MJ without ILUC and 73.2 g CO2e/MJ with ILUC), are much lower (around 32%).

Table 5-3 shows the calculated GHG emissions saved by replacing fossil fuels with corresponding biofuels for all 27 MS. Substitution of diesel by biodiesel and HVO results in GHG emission reductions as compared to the baseline in the order of 78% when ILUC is excluded, whereas these reductions are in the order of 46% when considering ILUC. The respective reductions for petrol substituted by bioethanol and ETBE are somewhat lower without ILUC but in the same order of magnitude, while they become higher when ILUC effects are considered (78%). Overall, this higher reduction in petrol-fuels compared to diesel ones is due to the high GHG ILUC values of oil crops from which mainly biodiesel is produced, and the much lower GHG ILUC values of cereals from which ethanol is produced.

The percentage of GHG emission reductions for natural gas for the 27 MS are of the same order of magnitude with petrol, but the overall effect is rather small due to the small quantities of CNG supplied.

Table 5-3 GHG emissions savings from the use of biofuels

Fossil fuel	Substituting biofuel	Excluding /including provisional mean values of the estimated ILUC emissions	GHG emissions from fossil fuels (kt CO_2e)	Emissions savings (kt CO_2e)	GHG emission reduction from substitution (%)
Diesel	Biodiesel + HVO	Excluding	59 375	46 191	77.8
		Including	59 375	27 452	46.2
Petrol	Bioethanol + ETBE	Excluding	11 458	8 899	77.7
		Including	11 458	7 599	66.3
CNG	Biogas	Excluding	966	795	82.4
		Including	966	784	81.2

6 Consistency between fuel volumes reported under Article 7a and Article 8

To ensure consistency, the reported fuel volumes under Article 7a are compared with those reported under Article 8 of the Fuel Quality Directive (FQD). The comparison is carried out for petrol and diesel only, both fossil and bio-based substitutes, as no other fuels are reported under Article 8.

The total volumes of petrol and diesel reported under Article 8 already includes blended biofuels, i.e. mainly bioethanol in petrol and biodiesel (and HVO) in diesel. To enable the comparison, all volumes of bioethanol, bio-ETBE and other petrol substitutes were added to the petrol volumes as reported by Member States under Article 7a. Similarly, all volumes of biodiesel, HVO and other diesel substitutes were added to the diesel volumes. Table 6-1 shows the results of the comparison for the 27 Member States that have reported under both Articles 7a and 8.

Table 6-1 Total quantities of fossil fuels and bio-based substitutes (million litres)

Member State	Petrol		Diesel		Difference (%)	
	Article 7a	Article 8	Article 7a	Article 8	Petrol	Diesel
Austria	1 911	1 923	7 763	7 800	-0.6%	-0.5%
Belgium	2 627	2 649	7 185	7 174	-0.8%	0.1%
Bulgaria	693	638	2 609	2 900	8.6%	-10.1%
Croatia	603	628	2 124	2 189	-4.0%	-3.0%
Cyprus	414	413	408	408	0.2%	-0.1%
Czechia	1 791	2 020	5 596	6 126	-11.3%	-8.7%
Denmark	1 734	1 728	3 189	3 169	0.3%	0.6%
Estonia	281	282	923	923	-0.20%	0.02%
Finland	1 777	1 753	2 875	2 893	1.4%	-0.6%
France	12 163	11 869	37 756	36 903	2.5%	2.3%
Germany	22 045	22 019	40 496	41 918	0.1%	-3.4%
Greece	2 722	2 715	3 078	3 187	0.3%	-3.4%
Hungary	1 971	1 974	777	4 619	-0.1%	-83.2%
Ireland	817	1 136	3 400	3 401	-28.1%	0.0%
Italy	9 202	9 277	1 987	29 204	-0.8%	-93.2%
Latvia	147	213	867	1 220	-30.9%	-28.9%
Lithuania	354	354	2 181	2 178	-0.1%	0.2%
Luxembourg	444	436	1 718	1 522	1.9%	12.9%
Malta	102	102	111	172	0.0%	-35.6%
Netherlands	5 277	5 305	6 619	5 738	-0.5%	15.4%
Poland	6 497	6 494	21 719	21 465	0.0%	1.2%
Portugal	1 196	1 092	4 925	4 244	9.5%	16.1%
Romania	1 969	1 488	6 878	5 628	32.4%	22.2%
Slovakia	722	722	2 340	2 340	0.0%	0.0%
Slovenia	469	476	1 791	2 084	-1.5%	-14.1%
Spain	6 749	6 972	25 227	25 816	-3.2%	-2.3%
Sweden	2 790	2 706	6 390	6 004	3.1%	6.4%
EU (27 Member States)	**87 469**	**87 384**	**200 933**	**231 225**	**0.10%**	**-13.10%**

For many Member States, the differences for both petrol and diesel are relatively small, within ±10%. However, there are also many Member States for which larger differences are observed, where total volumes reported under Article 7a are lower or higher than those reported under Article 8. For 2021 very high differences could be observed for Hungary, Ireland, Italy, Latvia, Malta and Romania.

The main reasons of such discrepancies from previous years include fuel quantities purchased and sold in different years, or incomplete reporting by Member States. It is not possible to distinguish to what extent the differences can be attributed to each of these reasons. In the case of Italy, where during the last three years the diesel quantities reported under Article 7a have been much lower than those reported under Article 8 and also much lower compared to other Member States of similar size, the reason for the discrepancy was not fully confirmed by Italy, see textbox.

Box 2 Italy

Italy stated in two Emails that the quantities of fuels reported under Article 7a are net of their biofuel content, whereas total data, including biofuels, are submitted under Article 8.

Table 7.1 shows the amount of fossil fuels together with their bio-based substitutes that were consumed in each MS. 246.194.120 lt of Diesel were reported for Italy, as well as 1.559.119.550 lt of biodiesel and 182.091.880 lt of HVO, which are considered as bio-based substitutes. So even if net quantities are reported, the reported value should be similar as bio-based substitutes are also considered. In another Email however the reason stated for the discrepancies was explained by the fact that for the Art. 8 reporting gasoil has been reported incorrectly as diesel. This would explain the data differences.

In the case of Latvia, it was confirmed that 6 out of 27 fuel suppliers did not report data under Article 7a, and it is assumed that this corresponds to 25-30% of the fuel supplied in the country. Similarly, at least one fuel supplier in Malta did not report data under Article 7a, while another source of error is due to the fact that reporting under Article 8 is based on national sales, whereas fuel placed on the market is reported under Article 7a. In the case of Ireland, non-transport fuels were mistakenly reported under Article 8, leading to the great differences observed in the above table.
Romania submitted a new data set on 23.08.2023 possibly addressing the issues of the data discrepancy. This information could not be taken up into the 2021 report due to its tardiness and its limited overall impact on the EU27 numbers. The 2021 information be incorporated in the next report whenever necessary. It was not possible to confirm with Hungary the reasons that caused the large discrepancies that were observed.

List of abbreviations

Abbreviation	Name
CHP	Combined heat and power
CNG	Compressed natural gas
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DLUC	Direct land use change
EEA	European Environment Agency
EFB	Empty fruit bunch
Eionet	European Environment Information and Observation Network
ETBE	Ethyl tert-butyl ether
ETC/ACM	European Topic Centre for Air Pollution and Climate Change Mitigation
EU	European Union
FAEE	Fatty acid ethyl esters
FAME	Fatty acid methyl esters
FFBS	Fresh fruit brunches
FQD	Fuel Quality Directive
GHG	Greenhouse gas
GJ	Gigajoule
HVO	Hydrotreated vegetable oil
ILUC	Indirect land use change
JRC	Joint Research Centre
LBG	Liquefied biogas
LNG	Liquified natural gas
LPG	Liquid petroleum gas
MJ	Megajoule
MTBE	Methyl tert-butyl ether
PFAD	Palm fatty acid distillate (PFAD)
PJ	Petajoule
POME	Palm oil mill effluent
QA/QC	Quality assurance/quality control
RUCO	Repurpose used cooking oil
SBE	Spent bleaching earth
TAEE	Tert-amyl ethyl ether

TJ	Terajoule
UER	Upstream emission reductions

Annex

Table A1-1 Greenhouse gas (GHG) intensity per fossil fuel type

Fuel or energy type	GHG intensity (g CO_2e/MJ)
Liquified petroleum gas	73.6
Compressed natural gas	69.3
Diesel	95.1
Petrol	93.3
Gas oil	95.1
Liquified natural gas	74.5
Other	93.3

Table A1-2 Average reported greenhouse gas (GHG) intensity per biofuel type (excluding ILUC)

Fuel or energy type	GHG intensity (g CO_2e/MJ)
Biodiesel	23.8
Bio-ETBE	26.6
Bioethanol	20.1
Biogas	12.2
Biomethanol	35.3
Bio-MTBE	33.2
Hydrotreated vegetable oil HVO	12.6
Pure vegetable oil	31.2
Other (Bioethanol diesel)	19.1
Other (Biofuel oil)	11.0
Other (biokerosine)	9.0
Other (Bio-LNG)	11.1
Other (Bio-LPG)	20.2
Other (Biomethane)	21.3
Other (Bionaphtha)	9.2
Other (Biopetrol)	63.1
Other (Biopropane)	7.7
Other (Co-processed HVO)	9.3
Other (Co-treated Oil for diesel)	23.9
Other (cracked HVO for gasoline)	28.1
Other (FAEE)	1.5
Other (hydrocarbons from co-hydrogenation from rapeseed oil)	31.0
Other (Hydrotreated oil - Diesel)	10.2
Other (Hydrotreated oil - Gasoline)	12.3

Table A1-3 Feedstocks used for biofuels

- Acid oil from used cooking oil
- Algae
- Animal fats classified as categories 1 and 2
- Animal manure and sewage sludge
- Bagasse
- Barley
- Biomass fraction of industrial waste
- Biomass fraction of mixed municipal waste
- Biomass fraction of wastes and residues from forestry and forest-based industries
- Bio-waste
- Brown grease
- Cobs cleaned of kernels of corn
- Corn (maize)
- Crude glycerine
- Grape marcs and wine lees
- Husks
- N/A
- Nut shells
- Other (Agri-food waste)
- Other (Animal fat category 3)
- Other (Animal manure and biomass fraction of industrial waste)
- Other (Animal manure and other cellulosic materials of non-food origin, sewage sludge, husks and straw)
- Other (Animal manure and sewage sludge, straw, husks, cobs cleaned of corn grains and other cellulosic materials of non-food origin)
- Other (Animal manure, sewage sludge, cobs cleaned of corn grains and other cellulosic materials of non-food origin)
- Other (Animal manure, triticale)
- Other (Animal manure, triticale, straw)
- Other (Animal manure, triticale,sorghum,corn stalks,straw,chaff of rice)
- Other (Bacteria)
- Other (Belly Grass)
- Other (Biomass fraction of mixed industrial and municipal solid waste and sewage sludge)
- Other (Biomass fraction of mixed industrial and municipal solid waste, sewage sludge and animal manure)
- Other (Biomass fraction of mixed municipal waste and sewage sludge)
- Other (Brown liquor)
- Other (Deep litter)
- Other (EFB)
- Other (Ethanol waste liquids)
- Other (Ethiopian mustard seed)
- Other (Feedstock molesses)
- Other (FFBs)
- Other (fodder beet)
- Other (Food waste)
- Other (Food waste, unsuitable for human and/or animal consumption)
- Other (free fatty acids)
- Other (grass)
- Other (Organic waste)
- Other (PFAD)
- Other (Poultry feather acid oil)
- Other (residues from the distilling industry)
- Other (Technical corn oil)
- Other (Triticale)
- Other (Vegetable mix fatty acid oil)
- Other (Waste from beverage production)
- Other (Waste from processing alcohol)
- Other (Whey Permeate)
- Other cereals
- Other oil crops
- Other sugar crops
- Other wastes and residues (not double counting)
- Others (Industrial food waste)
- Palm oil
- Palm oil mill effluent
- Palm oil mill effluent and empty palm fruit bunches
- Rapeseed
- Soapstock acid oil contaminated with sulphur
- Soybeans
- Spent bleached earth
- Starch slurry
- Straw
- Sugar beet
- Sugar cane
- Sunflower seed
- Tall oil pitch
- Tallow - category 3 or unknown
- Used cooking oil
- Waste pressings from production of vegetable oils
- Waste vegetable or animal oils
- Waste wood
- Wheat

Table A1-4 Biofuel production pathways

- Biogas from dry manure as compressed natural gas
- Biogas from dry manure as compressed natural gas
- Biogas from municipal organic waste as compressed natural gas
- Biogas from wet manure as compressed natural gas
- Farmed wood ethanol
- Hydrotreated vegetable oil from palm oil (process not specified)
- Hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)
- Hydrotreated vegetable oil from rape seed
- Hydrotreated vegetable oil from sunflower
- MTBE renewable component
- N/A
- Other (Acid oils extracted from soapy pastes)
- Other (Acid oils obtained from the fat of bird feathers resulting from an industrial process, consifromred waste, not suitable for use in the human or animal food chain)
- Other (Advanced)
- Other (Animal fat)
- Other (Animal manure and sewage sludge)
- Other (Bagasse)
- Other (Barley ethanol - natural gas as process fuel in CHP plant)
- Other (Barley ethanol (lignite as process fuel in CHP plant))
- Other (Barley ethanol)
- Other (BioBarley Ethanol)
- Other (Biocorn ethanol)
- Other (Biodiesel from acid oil)
- "Other (Biodiesel from acid oils obtained from the fat of bird feathers resulting from an industrial process,
- consifromred waste, not suitable for use in the human or animal food chain (poultry feather acid oil))"
- Other (Biodiesel from Animal fats classified as categories 1 and 2)
- Other (Biodiesel from biofromgradable food and kitchen waste from households)
- Other (Biodiesel from biofromgradable food and kitchen waste from industries)
- Other (Biodiesel from bleaching clay)
- Other (Biodiesel from Brown Grease)
- Other (Biodiesel from Crude glycerine)
- Other (Biodiesel from EFB)
- Other (Biodiesel from EFBs)
- Other (Biodiesel from effluent from oil mills that treat palm oil and empty palm fruits)
- Other (Biodiesel from empty fruit bunches)
- Other (Biodiesel from empty palm fruit bunches)
- Other (Biodiesel from esterification and transesterification of POME)
- Other (Biodiesel from esterification and transesterification of vegetable fatty acids)
- Other (Biodiesel from fatty acid)
- Other (Biodiesel from FFA(UCO))
- Other (Biodiesel from FFBs)
- Other (Biodiesel from food waste)
- Other (Biodiesel from household food waste, process not specified)
- Other (Biodiesel from Industrial food waste)
- Other (Biodiesel from industrial waste)
- Other (Biodiesel from oil crops)
- Other (Biodiesel from palm oil mill effluent)
- Other (Biodiesel from PFAD)
- Other (Biodiesel from POME)
- Other (Biodiesel from process by-product - fatty acid)
- Other (Biodiesel from process waste - feed production)
- Other (Biodiesel from process waste - flotation fat)
- Other (Biodiesel from process waste - plant based oil)
- Other (Biodiesel from process waste - special oil)
- Other (Biodiesel from process waste - thistleoil)
- Other (Biodiesel from sewage sludge)
- Other (Biodiesel from soapstock acid oil)
- Other (Biodiesel from soapstock)
- Other (Biodiesel from Spent bleached earth)
- Other (Biodiesel from sulfur-contaminated soap pastes)
- Other (Biodiesel from Talloil Pitch)
- Other (Biodiesel from Used cooking oil)
- Other (Biodiesel from waste based fatty acid)
- Other (Biodiesel from waste of processing vegetable fats, lubricants and soaps)
- Other (Biodiesel from waste vegetable oil or animal fat)
- Other (Biodiesel from waste vegetable or animal oil)
- Other (Biodiesel of separately collected used cooking oils and fats of vegetable origin)
- Other (Biodiesel produced from animal and vegetable oil wastes)
- Other (Biodiesel produced from biomass fraction of industrial waste)
- Other (Biodiesel produced from oil palm fresh fruit bunches (FFBs))
- Other (Biodiesel produced from tallow - category 3 or unknown)
- Other (Biodiesel produced from vegetable mix fatty acid oil)
- Other (Bio-ETBE from corn (maize))
- Other (Bioethanol diesel from biomass fraction of industrial waste and residues)
- Other (Bioethanol diesel from waste from beverage production)
- Other (Bioethanol from Bagasse)
- Other (Bioethanol from Barley)
- Other (Bioethanol from Biomass fraction of industrial waste)
- Other (Bioethanol from Bio-waste)
- Other (Bioethanol from brown liquor)
- Other (Bioethanol from corn (maize))
- Other (Bioethanol from molasses)
- Other (Bioethanol from rye)
- Other (Bioethanol from Starch slurry)
- Other (Bioethanol from triticale)
- Other (Bioethanol)
- Other (Biofuel oil from PFAD)
- Other (Biofuel oil from technical corn oil)
- Other (Biofuel oil from waste vegetable oil or animal fat)
- Other (Biogas from agri-food waste as compressed natural gas)
- Other (Biogas from animal fat)

- Other (Biogas from Animal manure and sewage sludge)
- Other (Biogas from bacteria as compressed natural gas)
- Other (Biogas from biomass fraction of industrial waste as liquified natural gas)
- Other (Biogas from biomass fraction of mixed industrial and municipal solid waste and sewage sludge as liquified natural gas)
- Other (Biogas from Bio-waste)
- Other (Biogas from Brown grease)
- Other (Biogas from Crude glycerine)
- Other (Biogas from deep litter as liquified natural gas)
- Other (Biogas from glycerine)
- Other (Biogas from husks)
- Other (Biogas from industrial waste)
- Other (Biogas from manure and agri-food waste as compressed natural gas)
- Other (Biogas from manure)
- Other (Biogas from Nut shells)
- Other (Biogas from sewage sludge as compressed natural gas)
- Other (Biogas from sewage sludge as liquified natural gas)
- Other (Biogas from Straw)
- Other (Biogas from Sugar beet)
- Other (Biogas from Used cooking oil)
- Other (Biogas from waste from processing alcohol as liquified natural gas)
- Other (Biogas from waste vegetable oils)
- Other (Biogas from waste vegetable or animal oils as liquified natural gas)
- Other (Biogas from whey permeate as liquified natural gas)
- Other (Biokerosine from animal fat)
- Other (Biokerosine from used cooking oil)
- Other (bio-LNG fom food waste)
- Other (bio-LNG fom manure)
- Other (bio-LPG from vegetable oils)
- Other (Biomethane from biomass as compressed natural gas)
- Other (Biomethane from biowaste as compressed natural gas)
- Other (Biomethane from fat seperation unit)
- Other (Biomethane from flotation fat)
- Other (Biomethane from sewage sludge as compressed natural gas)
- Other (Biomethane from waste food)
- Other (Biomethane from waste from food industry as compressed natural gas)
- Other (Biomethanol from Animal manure and sewage sludge)
- Other (Biomethanol from Bio-waste)
- Other (Biomethanol from organic municipal waste)
- Other (Biomethanol produced from biomass fraction of industrial waste)
- Other (Bionaphta from POME)
- Other (Bionaphta from SBE)
- Other (Bionaphta from UCO)
- Other (Bionaphta produced from palm oil)
- Other (Biopetrol from biomass fraction of industrial waste and residues)
- Other (Biopetrol from palm oil separated from the waste sludge of palm oil presses (process waste) or the fatty acid distillate obtained from it and the bottom fraction of the distillate)
- Other (Biopetrol from PFAD)
- Other (Biopetrol from POME)
- Other (Biopetrol from tall oil)
- Other (Biopetrol from technical corn oil)
- Other (Biopetrol from waste vegetable oil or animal fat)
- Other (Biopropano from empty palm fruit bunches)
- Other (Biopropano from palm oil mill effluent)
- Other (Biopropano from palm oil)
- Other (Biopropano from spent bleached earth)
- Other (Biopropano from waste vegetable or animal oil)
- Other (Bio-waste methanol)
- Other (Bran as process fuel in CHP plant)
- Other (Brown grease biodiesel)
- Other (Brown Grease)
- Other (Brown liquor ethanol)
- Other (cereals bioethanol)
- Other (contaminated soap pastes)
- Other (coprocessing desulphurisation of diesel oil in refinery)
- Other (Co-processing of pome oil and mineral oil)
- Other (corn (maize) ethanol)
- Other (Corn (maize) ethanol, Community produced (natural gas as process fuel in CHP plant))
- Other (Corn (maize))
- Other (corn bio-ETBE)
- Other (corn ethanol - natural gas as process fuel in CHP plant)
- Other (Corn ethanol (biomass as process fuel in biomass plant))
- Other (Corn ethanol (natural gas as process fuel in coventional plant))
- Other (Corn ethanol, natural gas as process fuel in CHP plant)
- Other (Corn ethanol, natural gas as process fuel in conventional boiler)
- Other (Corn ethanol, produced overseas (natural gas as process fuel in CHP plant))
- Other (Corn ethanol, produced overseas (natural gas as process fuel in conventional plant))
- Other (CORN)
- Other (Cottonceed biodiesel)
- Other (Crude glycerine)
- Other (D.R. Biodiesel)
- Other (diesel from biomass fraction corresponding to industrial waste not suitable for use in the food chain)
- Other (Esterification and transesterification)
- Other (Esterification from soapstock acid oils (oleins) with methanol)
- Other (Esterification process)
- Other (Estraction of oil from EFB and esterification)
- Other (ETBE renewable component)
- Other (Ethanol from biomass fraction of industrial waste and residues)
- Other (Ethanol from biowaste class 3)
- Other (Ethanol from cobs cleaned of kernels of corn (natural gas as process fuel in CHP plant))
- Other (Ethanol from cobs cleaned of kernels of corn (process not specified))
- Other (Ethanol from corn (maize) (natural gas as process fuel in CHP plant))

- Other (Ethanol from corn (maize) (process not specified))
- Other (Ethanol from ethanol waste liquids)
- Other (Ethanol from food waste)
- Other (Ethanol from grape marcs - natural gas as process fuel in CHP plant)
- Other (Ethanol from grape marcs)
- Other (Ethanol from industrial waste)
- Other (Ethanol from molesses)
- Other (Ethanol from organic solid waste)
- Other (Ethanol from other cereals, process fuel not specified)
- Other (Ethanol from residues from processing of alcohol - natural gas as process fuel in CHP plant)
- Other (Ethanol from residues from the distilling industry)
- Other (Ethanol from rye (natural gas as process fuel in conventional plant))
- Other (Ethanol from rye (process not specified)
- Other (Ethanol from sorghum)
- Other (Ethanol from starch slurry)
- Other (Ethanol from triticale)
- Other (Ethanol from waste (process fuel not specified))
- Other (Ethanol from waste from beverage production)
- Other (Ethanol from Waste residues from alcohol processing)
- Other (Ethanol from waste starch slurry)
- Other (Ethanol from wine lees)
- Other (Ethanol)
- Other (Ethyl-tert-butyl-ether (ETBE) - renewable component - waste residues from alcohol processing)
- Other (Ethyl-tert-butyl-ether (ETBE) - renewable component - waste starch slurry)
- Other (Ethyl-tert-butyl-ether (ETBE) - renewable component - waste)
- Other (Ethyl-tert-butyl-ether (ETBE) - renewable component)
- Other (FAEE fom fish oil ethyl ester)
- Other (FFA advanced)
- Other (FFA from UCO)
- Other (FFA)
- Other (FFA's from crude glycerin; Acid oils from soapstocks)
- Other (Food waste from households)
- Other (forestry waste methanol)
- Other (Grape Marcs)
- Other (Grape pomace and grape juice bioethanol)
- Other (Hardening mud)
- Other (HVO from technical corn oil)
- Other (HVO Bionaphta from palm oil (process not specified))
- Other (HVO from Palm oil mill effluent and empty palm fruit bunches)
- Other (HVO from animal fat category 3)
- Other (HVO from food waste)
- Other (HVO from palm oil mill effluent)
- Other (HVO from palm oil separated from the waste sludge of palm oil presses (process waste) or the fatty acid distillate obtained from it and the bottom fraction of the distillate)
- Other (HVO from PFAD)
- Other (HVO from POME)
- Other (HVO from SBE)
- Other (HVO from SBEO)
- Other (HVO from soybean)
- Other (HVO from spent bleached earth)
- Other (HVO from tall oil)
- Other (HVO from Used cooking oil)
- Other (HVO from waste vegetable oil and/or animal fat)
- Other (HVO)
- Other (HVO-diesel from effluent from oil mills handling palm oil and empty palm fruit bundles)
- Other (HVO-Diesel from PFAD)
- Other (HVO-Diesel from soybeans)
- Other (HVO-Diesel from sunflower seed)
- Other (HVO-Diesel from UCO)
- Other (HVO-GPL form palm oil)
- Other (HVO-GPL from biomass fraction corresponding to industrial waste not suitable for use in the food chain)
- Other (HVO-GPL from effluent from oil mills handling palm oil and empty palm fruit bundles)
- Other (HVO-GPL from PFAD)
- Other (HVO-GPL from soybean)
- Other (HVO-GPL from UCO)
- Other (HVO-NAFTA from biomass fraction corresponding to industrial waste not suitable for use in the food chain)
- Other (HVO-NAFTA from effluent from oil mills handling palm oil and empty palm fruit bundles)
- Other (HVO-NAFTA from soybean)
- Other (HVO-NAFTA from UCO)
- Other (hydrocarbons from co-hydrogenation from rapeseed oil)
- Other (hydrotreated biomass fraction of industrial waste)
- Other (Hydrotreated oil from industrial waste)
- Other (Hydrotreated oil from palm effluents and bunches)
- Other (Hydrotreated oil from sewage sludge)
- Other (Hydrotreated oil from tall oil pitch)
- Other (Hydrotreated oil from tallow)
- Other (Hydrotreated oil from UCO)
- Other (Hydrotreated oil palm fresh fruit bunches (FFBs))
- Other (Hydrotreated palmoil (process fuel not specified))
- Other (Hydrotreated tallow - category 3 or unknown)
- Other (Hydrotreated used cooking oil - 100% origin vegetable oil)
- Other (Hydrotreated used cooking oil - origin animal oil or animal+vegetable oil)
- Other (HYDRO-TREATMENT)
- Other (Industrial food waste)
- Other (Lignite as process fuel in CHP plant)
- Other (Methanisation)
- Other (Molasses ethanol)
- Other (Neutralization, Esterification, Transesterification and Distillation)
- Other (Non-Community produced (100.00%))
- Other (Non-food cellulosic material)
- Other (non-sustainable bioethanol)
- Other (non-sustainable biofuel oil)
- Other (non-sustainable biogas)
- Other (non-sustainable biopetrol)
- Other (Oils or fats collected through separators or traps placed in drains)

- Other (Palm Bunches)
- Other (Palm Fatty Acid Destillate)
- Other (Palm oil mill effluent and empty palm fruit bunches)
- Other (Palm oil mill effluent)
- Other (Physical refining of used cooking oil preliminar to biodiesel production and esterification of fatty acids)
- Other (POME oil)
- Other (production waste)
- Other (sewage sludge methanol)
- Other (Sewage sludge)
- Other (Simultaneously processed (processed in a refinery at the same time as fossil fuels)
- Other (Soap Pastes Contaminated with Sulfur)
- Other (Sorghum ETBE)
- Other (Sorghum ethanol)
- Other (Spent bleach or filter soils from an industrial process)
- Other (Spent bleached earth)
- Other (starch slurry)
- Other (sugar beet bio-ETBE)
- Other (Sugar beet residues)
- Other (sugar cane bio-ETBE)
- Other (Technical corn oil - advanced)
- Other (Technical corn oil)
- Other (Trader)
- Other (Trading)
- Other (Transesterifiation of fatty acids internally generated from the biodiesel production process)
- Other (Transesterification and distillation)
- Other (Transesterification)
- Other (Triticale)
- Other (Used cooking oil - 100% vegetable origin)
- Other (Used cooking oil)
- Other (Used cooking oils and fats of vegetable)
- Other (Used Oil from Bleached Earth)
- Other (Vegetable oil treated with hydrogen from biodegradable food and food waste from industries)
- Other (Waste cooking oil and animal/vegetable fats)
- Other (wheat bio-ETBE)
- Other (Wheat ethanol (bran as process fuel in CHP plant))
- Other (Wheat)
- Palm oil biodiesel (process not specified)
- Palm oil biodiesel (process with methane capture at oil mill)
- Pure vegetable oil from rape seed
- Rapeseed biodiesel
- Soybean biodiesel
- Sugar beet ethanol
- Sugar cane ethanol
- Sunflower biodiesel
- Waste vegetable oil or animal fat biodiesel
- Waste wood ethanol
- Waste wood Fischer-Tropsch diesel
- Waste wood methanol
- Wheat ethanol (lignite as process fuel in CHP plant)
- Wheat ethanol (natural gas as process fuel in CHP plant)
- Wheat ethanol (natural gas as process fuel in conventional boiler)
- Wheat ethanol (process fuel not specified)
- Wheat straw ethanol

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