



AUSTROCEL HALLEIN GMBH/STEFAN KREMSL

Since 2020, a score of heavy-duty vehicles such as household waste collection vehicles, scheduled coaches serving Lyon and company vehicles make their daily runs powered by biogas produced by the Methamoly biomethane plant located in the Monts du Lyonnais.

+ 2.0 %

The increase of renewable energy consumption for transport in the EU27 between 2021 and 2022 (in energy content)

RENEWABLE ENERGY IN TRANSPORT BAROMETER

A study carried out by EurObserv'ER.  EurObserv'ER

The preliminary data gathered by EurObserv'ER suggests that renewable energy consumption in European Union transport, be it road, rail, maritime or air transport, driven by combustion or electric engines, increased by about 2.0% between 2021 and 2022, to almost 19.4 Mtoe. As lockdown measures were gradually lifted in 2021, transport needs returned to normal. The renewable energy share of European Union transport, as defined by the Renewable Energy Directive (known as RED II), should inch forwards towards the 10% threshold through the application of the incentives arising from greater use of advanced biofuels and the development of electrification in road transport.

25.9 TWh (eq 2.2 Mtoe)

Renewable electricity used in transport (road, rail, other transport modes) in the EU27 in 2022

17.2 Mtoe

Total biofuel consumption in EU27 transport in 2022



One of the key issues in tackling climate change is decarbonising transport, which when viewed as a whole (road, air, rail or maritime) accounts for about a quarter of greenhouse gas (GHG) emissions in CO₂ equivalent units (including CO₂, CH₄, N₂O and HFC). It is also a strategic policy subject for the European Union, given the technological choices to be implemented over the long term and their implications on the economy.

RES IN TRANSPORT AT THE HEART OF THE EU'S ECOLOGICAL TRANSITION

The European Union shifted its renewable energy policy for transport by requiring biofuels used in the EU

to comply with sustainable development criteria, when the first renewable energy directive 2009/28/EC (known as RED I) was rolled out. It subjected them to quantitative criteria relating to GHG emissions and qualitative criteria relating to land use, to prevent their production on biodiversity-rich and high carbon store lands or peat bogs. The sustainability criteria for using biomass and biofuels have since been considerably toughened. The first time was in 2015, when the 2015/1513 "ILUC" (Indirect Land Use Change) Directive was enacted. It embodied the lawmakers' wish to take into account the effects of land use change by setting limits to the use of food crop biofuels. Since then, adoption of the Renewable

Energy Directive 2018/2001 (known as RED II) has reinforced the biomass sustainability criteria even further by identifying the raw materials most at risk from the ILUC effect (such as palm oil), with measures to cap their incorporation and phase them out altogether by 2030. The European transport decarbonisation policy now favours consumption of "advanced" biofuels and biogas, renewable fuels of non-biological origin (RFONBOs) produced from hydrogen and recycled carbon fuels (RCFs), "green" hydrogen fuel. It also aims to electrify road transport wholesale in tow with the European policy for decarbonising the electricity mix through renewable energies. More recently, new steps have been taken to accelerate energy

transition. The European Green Deal presented by the European Commission in December 2019, is the European Union strategy implemented to achieve the goal of climate neutrality by the 2050 timeline. The Green Deal aims to reduce transport related GHG emissions by 90% by that date to achieve a more sustainable mobility system. The European Green Deal was launched in July 2021 when the Commission presented detailed measures geared to reducing net GHG emissions by at least 55% from 1990 levels by 2030. These climate measures are covered by the "Fit for 55" package. Following a lengthy legislative process involving the European Parliament and the European Council, many pieces of legislation governing

transport (regulations and directives) were adopted during 2023, including the long-awaited recast Renewable Energy Directive, directive 2023/2413 (known as RED III) that was formally adopted on 18 October 2023 and published in the Official Journal of the European Union (OJEU) on 31 October 2023. The renewable energy consumption target for transport, which RED II originally set at 14% for each Member State was amended by RED III to offer the states more flexibility by allowing them to choose between two goals. They can choose between a binding goal of reducing GHG intensity in transport by 14.5% resulting from the use of renewable energies by 2030, and a binding renewable energy share of at least 29% in the transport sector's final

renewable energy consumption by 2030. The legal texts adopted in 2023 that stipulate the measures and instruments rolled out to decarbonise each type of transport are discussed in more detail towards the end of this barometer.

THE RES SHARE IN EU TRANSPORT APPROACHED 10% IN 2022

While this barometer was being written in November, the renewable energy share in European Union transport for 2022, defined using the RED II calculation rules, was not formally available. However, EurObserv'ER, which bases its hypotheses on the calculations and preliminary data of several Member States,

Tabl. n° 1

Biofuels consumption for transport in the European Union in 2021 (in ktoe)

Country	Biodiesel*	Biogasoline	Biogas**	Total	Compliant biofuels***
Germany	2 166.6	734.7	82.8	2 984.0	2 961.7
France	2 185.9	710.2	1.6	2 897.8	2 897.8
Italy	1 388.4	27.1	136.5	1 552.0	1 551.9
Spain	1 410.1	140.6	0.0	1 550.6	1 549.9
Sweden	1 221.8	117.3	112.6	1 451.8	1 451.8
Poland	911.7	208.0	0.0	1 119.7	1 119.7
Belgium	606.8	118.7	0.0	725.5	725.5
Finland	557.2	113.5	12.1	682.8	663.9
Netherlands	360.8	233.2	40.8	634.8	630.2
Romania	374.8	120.9	0.0	495.8	495.8
Austria	410.3	49.3	0.4	460.0	460.0
Czechia	287.2	55.5	18.9	361.6	361.6
Portugal	323.1	17.1	0.0	340.2	339.0
Hungary	196.7	87.0	0.0	283.7	283.7
Denmark	179.0	81.8	8.8	269.7	269.7
Greece	131.4	68.1	0.0	199.5	160.8
Ireland	163.7	20.3	0.4	184.4	184.4
Bulgaria	148.8	20.8	0.0	169.6	166.8
Slovakia	134.4	26.1	0.0	160.5	160.5
Luxembourg	118.6	17.9	0.0	136.5	136.5
Lithuania	110.4	16.5	0.0	126.9	126.9
Slovenia	94.0	8.6	0.0	102.6	102.5
Croatia	90.4	0.8	0.0	91.2	91.2
Estonia	41.4	4.2	11.8	57.5	57.5
Latvia	34.0	11.7	0.0	45.8	45.8
Cyprus	26.2	0.0	0.0	26.2	26.2
Malta	10.9	0.0	0.0	10.9	10.8
Total EU 27	13 684.6	3 010.1	426.8	17 121.5	17 010.5

* Including HVO and marginal consumption of "other liquid biofuels" ** Including biomethane blended in the natural gas grid allocated to the transport sector with appropriate traceability requirements. *** Compliant biofuels (articles 29 and 30 of Directive 2018/2001 EU) Source: EurObserv'ER 2023

Tabl. n° 2

Biofuels consumption for transport in the European Union in 2022* (in ktoe)

Country	Biodiesel**	Biogasoline	Biogas***	Others liquid biofuels	Total	Compliant biofuels****
France	2 203.4	854.8	2.7	26.9	3 087.8	3 078.3
Germany	2 194.9	761.0	91.3	1.8	3 048.9	2 919.1
Italy	1 354.1	35.0	184.9	0.0	1 573.9	1 573.0
Sweden	1 199.1	127.5	127.3	0.0	1 454.0	1 454.0
Spain	1 327.6	118.6	0.0	0.0	1 446.2	1 445.5
Poland	891.5	221.7	0.0	0.0	1 113.2	1 113.2
Belgium	629.2	133.8	0.0	0.0	763.0	763.0
Netherlands	301.2	251.1	40.7	21.0	613.9	613.9
Finland	461.6	117.4	12.1	0.0	591.0	591.0
Romania	374.8	120.9	0.0	0.0	495.8	495.8
Austria	389.0	51.6	0.4	0.0	440.9	440.9
Czechia	259.8	63.2	39.1	0.0	362.1	362.1
Portugal	325.0	26.0	0.0	0.0	351.0	350.0
Hungary	223.7	91.9	0.0	0.0	315.6	315.6
Denmark	154.2	79.9	8.8	0.0	243.0	243.0
Greece	131.4	68.1	0.0	0.0	199.5	199.5
Bulgaria	163.1	27.0	0.0	0.0	190.1	190.1
Ireland	163.7	20.3	0.4	0.0	184.4	184.4
Slovakia	142.2	29.0	0.0	0.0	171.2	171.2
Luxembourg	107.0	20.0	0.0	0.0	127.0	127.0
Lithuania	100.0	19.7	0.0	0.0	119.7	119.7
Croatia	90.4	0.8	0.0	0.0	91.2	91.2
Slovenia	71.2	8.0	0.0	0.0	79.2	79.2
Estonia	26.0	2.0	12.9	0.0	40.9	40.9
Cyprus	20.3	0.0	0.0	0.0	20.3	20.3
Latvia	5.9	10.1	0.0	0.0	16.0	16.0
Malta	12.8	0.0	0.0	0.0	12.8	12.8
Total EU 27	13 323.0	3 259.3	520.5	49.7	17 152.4	17 031.9

* Estimation ** Including HVO *** Including biomethane blended in the natural gas grid allocated to the transport sector with appropriate traceability requirements. **** Compliant biofuels (articles 29 and 30 of Directive 2018/2001 EU) Source: EurObserv'ER 2023





believes that against the backdrop of increased energy consumption in transport, the renewable energy share should increase over its 2021 level (measured at 9.1%) and approach the 10% threshold. We should bear in mind that the European Union-wide renewable energy share in transport, calculated using the calculation rules defined by the previous renewable energy directive (2009/28/CE) (known as RED I), was put at 10.3% in 2020. EurObserv'ER does not attribute this drop between 2020 and 2021 in any way to slacking by the Member States, but thinks that it can be broadly explained by the changes to the accounting rules arising from RED II – namely, tougher sustainability criteria that made certain types of biofuel non-compliant, the cap on the contribution of biofuels or biogas produced from used cooking oils or animal fats at 1.7% and new calculation rules for accounting for renewable electricity consumption in transport. The renewable energy shares in transport calculated for 2021 and 2022 are now comparable because they are based on the same calculation rules. The first official estimates available indicate that they should rise from 8.0 to 9.6% in Germany, 8.2 to 8.9% in France, 9.2 to 9.7% in Spain,

8.6 to 8.8% in Portugal, 9.0 to 10.8% in the Netherlands, 10.2 to 10.3% in Belgium and 8 to 8.3% in Luxembourg. The RES share should be stable in Czechia at 7.2%, while it is expected to slip in Denmark from 10.5 to 10.3%.

On the basis of the data gathered, EurObserv'ER would argue that the expected increase in the renewable energy share in European Union

SunPine AB, which is partly owned by Sweden's Preem group, commissioned a new biorefinery on the Pitea site that has increased its tall oil production capacity by 50%.

transport in 2022 is neither the result of an increase in biofuel consumption nor an increase in biofuel incorporation volumes in road fuels. Rather, it can be

GHG EMISSIONS INCREASING IN TRANSPORT

The Eurostat database (data provided by the European Environment Agency) shows that transport was responsible for about 24.1% of the EU's total GHG emission (in CO₂ equivalent units) in 2021, with road transport alone accounting for 23.2% of these emissions. A 90% reduction of transport related GHG emissions from 1990 levels is required by 2050, as part of the efforts to reduce CO₂ emissions and achieve climate neutrality by 2050 and in line with the European Green Deal roadmap. Currently a lot of backpedalling is going on. Following a sharp 13.5% drop in transport related GHG emissions between 2019 and 2020, due to the COVID-19 pandemic, according to European Environment Agency (EEA) data, they surged upwards (by 8.6%) between 2020 and 2021 from 720.2 to 782.1 Mtonnes (million tonnes) and the EEA forecasts a further 2.7% increase for 2022, which would restore emission levels to above the 800-Mtonne threshold (803.2 Mtonnes in 2022). CO₂ emissions account for almost all transport related GHG emissions (98.9% in 2021), and far outstrip those of nitrous oxide (N₂O) (0.9% in CO₂ equivalent units) and methane (0.2% in CO₂ equivalent units)

credited to the extended consumption of “advanced biofuels” (those produced from the raw materials listed in Annex IX, part A), whose contribution can be considered as equivalent to double their energy content in the targets and also by an increased renewable electricity consumption in transport, arising from both the increase in road and rail traffic, the entry into service of an additional 2 million electric vehicles in 2022 in the EU (whose total fleet is 6 million)

and most importantly the increase in the renewable energy share of gross electricity output in the European Union.

Incidentally, maritime and air transport should contribute more towards attaining the renewable energy targets for transport in the coming years, through the adoption of the new ReFuelEU Aviation and FuelEU Maritime regulations that aim to stimulate the adoption of renewable and low-carbon fuels in

these transport modes. Road transport will also continue to pursue the targets, both through the electrification of road transport (in parallel with the increase in the renewable energy share in the electricity production mix) and through the new CO₂ emission standards for newly registered heavy-duty vehicles that will force suppliers to incorporate more lower carbon-intensity fuels.

Tabl. n° 3

Biofuel consumption whose raw materials used are considered to be equivalent to twice their energy content in 2021, illustrative data for 2022 (in ktoe)*

Country	2021			2022		
	Advanced biofuel ¹	Used cooking oil and animal fats ²	Total 2021	Advanced biofuel ¹	Used cooking oil and animal fats ²	Total 2022
Italy	538.3	800.1	1 338.4	612.9	857.6	1 470.5
Spain	471.3	396.0	867.3	767.7	401.3	1 168.9
Germany+	183.7	442.4	626.1	278.8	671.2	950.0
Sweden+	332.2	300.6	632.7	332.2	300.6	632.7
Netherlands	145.7	361.6	507.2	168.5	299.4	467.9
France	71.2	111.8	183.0	135.4	189.4	324.8
Portugal	83.8	172.4	256.2	113.6	172.4	286.0
Hungary+	0.2	163.8	164.0	0.2	163.8	164.0
Ireland+	0.4	160.4	160.8	0.4	160.4	160.8
Czechia	19.2	67.8	87.1	48.5	47.0	95.4
Finland+	83.2	6.1	89.3	83.2	6.1	89.3
Slovenia+	30.9	56.3	87.2	30.9	56.3	87.2
Belgium	27.6	39.8	67.4	28.4	55.3	83.7
Bulgaria+	9.1	62.3	71.3	9.1	62.3	71.3
Luxembourg	0.0	55.3	55.3	0.0	53.0	53.0
Slovakia+	8.0	37.7	45.7	8.0	37.7	45.7
Estonia+	34.1	4.2	38.3	34.1	4.2	38.3
Croatia+	0.0	35.5	35.5	0.0	35.5	35.5
Greece+	0.0	34.9	34.9	0.0	34.9	34.9
Denmark	17.4	38.0	55.5	13.0	18.0	31.0
Cyprus+	2.1	20.1	22.2	2.1	20.1	22.2
Poland+	20.8	0.0	20.8	20.8	0.0	20.8
Latvia+	12.3	0.0	12.3	12.3	0.0	12.3
Malta+	1.8	8.9	10.8	1.8	8.9	10.8
Austria+	0.0	0.5	0.5	0.0	0.5	0.5
Lithuania	0.0	0.0	0.0	0.0	0.0	0.0
Romania	0.0	0.0	0.0	0.0	0.0	0.0
Total EU 27	2 093.5	3 376.3	5 469.8	2 701.8	3 655.8	6 357.5

* Within the authorised limits for biofuels produced from feedstocks listed in Part B of Annex IX. 1. Advanced biofuels means biofuels that are produced from the feedstock listed in Part A of Annex IX of the Directive (EU) 2018/2001. Note: the consumption data of the biofuels produced from raw materials enabling them to be considered as equating to twice their energy content for the countries marked with an «+» were not available for the year 2022 during our survey, by default EurObserv'ER used for the year 2022 the same consumption data as for 2021, except for Germany. The data for 2022 for the consumption of these types of biofuels therefore remain indicative. Source: EurObserv'ER 2023



PART 1: BIOFUEL AND BIOGAS IN TRANSPORT

CONSUMPTION OF INCREASINGLY "ADVANCED" BIOFUEL

The preliminary data gathered by EurObserv'ER suggests that broadly, the European Union's biofuel consumption (in energy content) remained stable at about 17.1 Mtoe. This consumption stability conceals the consumption changes of all the fuel types, namely, the lowering of biodiesel consumption, offset by the increase in biopetrol and biogas fuel consumption. It should be pointed out in the case of biogas fuel consumption

that the statistics given in tables 1 and 2, include the consumption of biomethane injected into the natural gas grid declared as being used in the transport sector. Going into detail, taken as a whole, irrespective of the raw materials used for its production (oilseed crops, non-food crop raw materials and biomass waste) and its production method (biodiesel produced by transesterification and HVO biodiesel produced by hydrotreatment), and of whether or not it is considered as "advanced", biodiesel consumption slipped by 2.6% between 2021 and 2022 and by just over 13.3 Mtoe across the European Union. This is not to say that the falloff was widespread. It primarily

resulted from lower consumption in the Netherlands (a 16.5% YoY drop), and Finland (a 17.2% YoY drop), Denmark (by 13.9%), Spain (5.8%) and to a lesser extent by drops in consumption in Italy (2.5%) and Germany (1.3%). The main reason for these drops is the greater availability of advanced biofuel category biodiesels on the market, which paved the way for double accounting of their energy content for the purposes of national target calculations.

Biogasoline (term equivalent to "biopetrol") consumption gained from the rise in demand for petrol in several countries that mechanically led to higher incorporation volumes. According to EurObserv'ER,

the growth in biogasoline consumption was about 8.3% between 2021 and 2022, settling at just below 3.3 Mtoe. In the EU, increased consumption by France was the highest -20.4% - over the twelve month period for a total of 854.8 ktoe (a 144.5-ktoe YoY rise). This exceptionally strong growth can be put down to the increasing monthly desertion from diesel to petrol consumption, primarily due to tax redistribution measures between diesel and petrol. The surge in biogas fuel consumption was even greater. EurObserv'ER puts the annual increase at 22.0%, for the first time passing the 0.5-Mtoe mark (520.5 ktoe). The resolve of a few countries, primarily Sweden

and Italy, to allocate the bulk of their biomethane production to the transport sector and promote biomethane (BioNGV) and liquified biomethane (BioNGL) use is behind this clear increase. Statistics Sweden, for example, states that Sweden sharply increased its liquified biomethane consumption in transport, which rose from 7 324 tonnes (equating to 9 ktoe) to 18 749 tonnes (equating to 23 ktoe) between 2021 and 2022.

INVESTMENTS IN ADVANCED BIOFUELS PICKING UP SPEED

The build-up in advanced biofuels can be attributed to the rollout of the Renewable Energy Directive 2018/2001/

EC which embodied the EU's wish to limit the use of food crop biofuels and curb the effects of indirect land use change by identifying the most at-risk raw materials. EurObserv'ER believes that advanced biofuel consumption, which also encompasses the petrol sector (but to a lesser extent), rose by 29.1% between 2021 and 2022 to reach about 2.7 Mtoe. This is a guesstimate, as several of the major consumer countries' consumption figures were provisional and could not be released for this study.

The rise in advanced biofuel consumption can be explained by the major



Tabl. n° 4

Renewable electricity used in transport (road, rail, other transport modes) in 2021 and 2022* (in ktoe)

Country	2021			Total
	Ren. electricity in road transport	Ren. electricity in rail transport	Ren. electricity in all other transport modes	
Germany	48.9	405.4	0.0	454.4
Italy	13.2	155.9	158.3	327.4
Sweden	87.8	156.7	0.0	244.5
France	15.3	150.8	17.1	183.1
Austria	0.9	120.9	86.1	207.8
Spain	11.3	99.4	7.2	117.9
Netherlands	16.9	25.7	0.0	42.7
Romania	6.9	42.2	1.8	50.9
Denmark	13.3	25.7	0.0	39.0
Poland	0.8	39.7	1.3	41.9
Belgium	4.6	27.6	0.7	32.9
Finland	7.7	22.6	0.0	30.3
Portugal	0.8	20.8	0.2	21.8
Czechia	0.9	19.0	0.9	20.8
Hungary	0.7	9.9	0.1	10.7
Croatia	0.3	10.2	1.6	12.2
Slovakia	0.5	8.9	1.8	11.1
Bulgaria	0.8	8.3	0.2	9.3
Slovenia	0.1	6.3	0.2	6.6
Latvia	1.3	3.0	0.1	4.5
Greece	0.3	4.5	0.0	4.7
Ireland	2.0	1.5	0.0	3.5
Luxembourg	0.2	1.3	0.0	1.6
Lithuania	0.8	0.2	0.3	1.3
Estonia	0.3	0.2	0.0	0.6
Malta	0.0	0.0	0.0	0.0
Cyprus	0.0	0.0	0.0	0.0
Total EU 27	236.7	1366.7	278.0	1881.4

* Estimation. In some countries a significant share of renewable electricity consumption in transport is not clearly traced and is allocated, by default, to the category «other transport modes». Source: EurObserv'ER 2023

Country	2022			Total
	Ren. electricity in road transport	Ren. electricity in rail transport	Ren. electricity in all other transport modes	
Germany	94.0	445.2	0.0	539.2
Italy	21.5	169.7	172.4	363.6
Sweden	137.2	163.9	0.0	301.1
France	16.9	182.2	19.0	218.1
Austria	1.4	125.9	89.7	216.9
Spain	19.7	120.8	8.5	149.0
Netherlands	38.0	39.2	0.0	77.2
Romania	13.3	43.0	1.8	58.1
Denmark	22.0	28.0	0.0	50.0
Poland	1.6	45.0	1.5	48.1
Belgium	10.5	32.7	3.8	47.0
Finland	12.4	23.5	0.0	35.9
Portugal	1.8	21.2	0.3	23.3
Czechia	0.9	20.6	1.0	22.5
Hungary	2.0	11.8	0.1	13.9
Croatia	0.5	11.1	1.8	13.3
Slovakia	0.8	9.2	1.9	11.9
Bulgaria	1.1	8.3	0.2	9.7
Slovenia	0.2	6.8	0.2	7.2
Latvia	2.6	3.0	0.1	5.8
Greece	0.5	5.1	0.0	5.7
Ireland	3.4	1.7	0.0	5.1
Luxembourg	0.6	1.7	0.0	2.3
Lithuania	1.0	0.2	0.4	1.6
Estonia	0.6	0.3	0.0	0.9
Malta	0.0	0.0	0.0	0.0
Cyprus	0.0	0.0	0.0	0.0
Total EU 27	404.6	1520.0	302.6	2227.3





The Methamoly biomethane plant located in the Monts du Lyonnais has its own BioNGV station. The site, which went on stream in 2019, treats the livestock manure of six local farms and local biowaste.

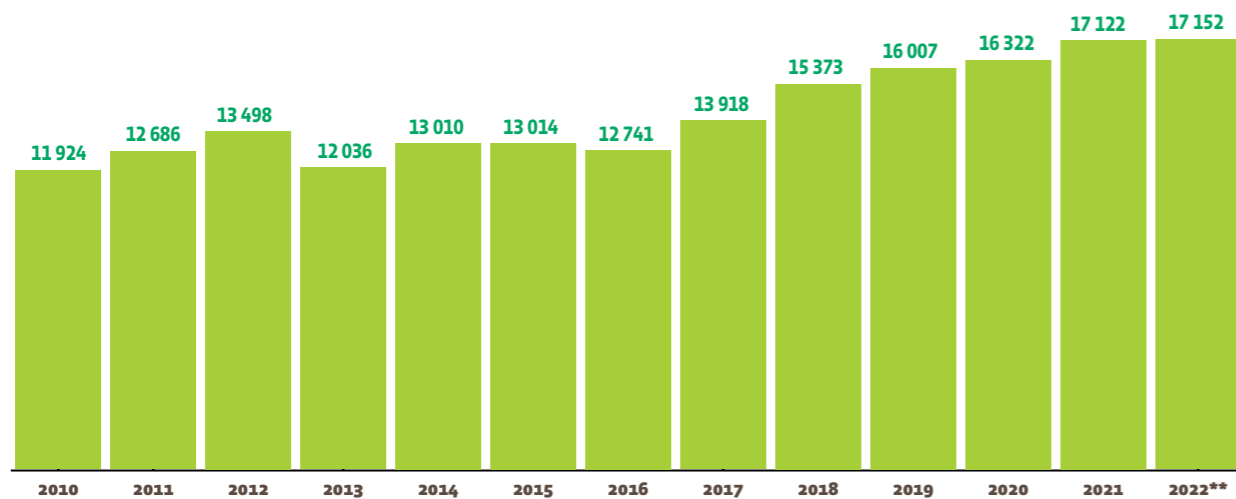
investments made by several energy groups, generally from the oil sector (Neste, Preem, Eni, Shell, UPM, St1, etc.), and also the technical feasibility of some HVO biodiesel production refineries to change their supply sources to process eligible raw materials. The challenge for these industrial concerns is to find these highly sought-after raw materials in the global market and safeguard their supply. The USDA (United States Department of Agriculture) and the GAIN network (Global Agricultural Information Network) reviewed European advanced

biofuel projects in their annual publication, Biofuel Annual – European Union 2023. In the matter of HVO biodiesel, Neste is expanding its Rotterdam refinery to raise its production capacity to 1.3 million tonnes of HVO Biodiesel and SAF (sustainable aviation fuel). The company aims to start up the new production plant during the first half of 2026. Apart from Neste, UPM and Shell also plan to construct HVO/SAF plants at Rotterdam with capacities of 640 million litres and 1 billion litres, respectively. These three upcoming plants should

be fully operational in 2025. In Finland, Fintoil has constructed a raw tall oil refinery designed to process 200 000 tonnes (with a view to producing 100 million litres of renewable diesel), which went on stream in the autumn of 2022. This output is intended for the UPM group's Lappeenranta HVO biodiesel refinery. Italy's Eni has stopped importing palm oil for its Gela and Venice refineries since October 2022 to comply with European regulations. The plants now

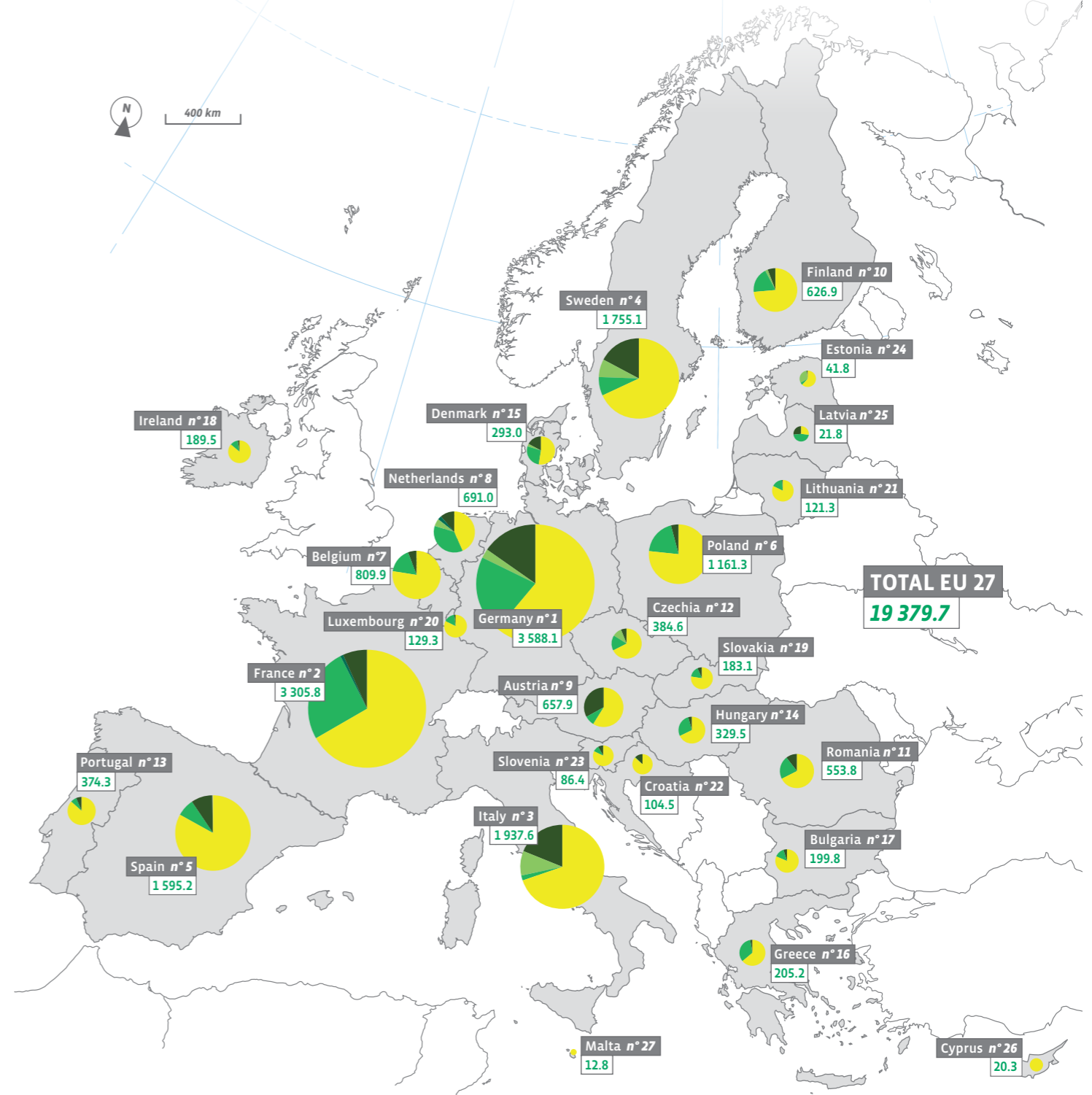
Graph. n° 1

European Union (EU-27) biofuel* (liquid and gaseous) consumption trends for transport trend (in ktoe)



* Compliant biofuel and not compliant. ** Estimation. Source: Data from 2010 to 2020 (Shares Eurostat 2023); 2021-2022 (EurObserv'ER 2023)

Renewable energies used in transport (road, rail, other transport modes) in 2022* (in ktoe)



Key

Country
19 379.7
Renewable energies used in transport (road, rail, other transport modes) in 2022* (in ktoe)

■ Biodiesel**
■ Biogasoline
■ Biogas***
■ Renewable electricity
■ Others liquid biofuels

* Estimation
 ** Including HVO
 *** Including biomethane blended in the natural gas grid allocated to the transport sector with appropriate traceability requirements.
 Source: EurObserv'ER 2023.

process waste and residues, as well as advanced raw materials such as bio-oils from lignocellulosic waste. Eni plans to increase its total annual HVO biodiesel capacity to 3 million tonnes by 2025 and to over 5 million tonnes by 2030. In Sweden, Preem recently increased the production capacity of its Gothenburg plant to 220 million litres. Preem takes a variety of raw materials, in particular tall oil from SunPine, in addition to food waste as input. The company plans to increase its HVO/SAF production further to 1.3 billion litres in 2023 and to 5 million litres in 2030. In order to achieve this, a 950 million-litre plant should come on stream at Lysekil in 2024. Finland's St1 plans to produce up to 250 million litres of HVO/SAF at Gothenburg (Sweden)

from 2023 onwards. Frying oil and tall oil will probably be its feedstock. St1 is furthermore considering the construction of a 500 million-litre capacity plant that should start up in about five years' time. There are also advanced biofuel projects for cellulosic ethanol. By way of example, Poland's oil company, the ORLEN Group, announced in February 2022 that it would be constructing an advanced bioethanol production facility with 32 million litres of planned annual capacity to process non-food feedstock... primarily straw. The plant should start operating in 2025. Other projects are on the drawing board. Finland's Nordfuel plans to construct a biorefinery that will produce 80 million litres of ethanol from wood per

annum. BioEnergio plans to construct a similar plant with an annual capacity of about 60 million litres. Neste intends to increase its global SAF production capacity to 1.5 billion litres in 2024, which includes capacity in its Rotterdam plant. Eni also produces SAF in its Gela and Venice plants and plans to produce an additional 250 million litres by 2024. As for maritime transport, Engie aims to construct a 2nd-generation 20-MW biomethane production plant at Le Havre based on the pyrogasification process, funded by an investment of 150 million euros. This project, dubbed Salamandre, will start producing 11 000 tonnes of biomethane per annum for the maritime transporter CMA CGM as soon as 2026/2027.

Tabl. n° 5

New passenger electric car registrations (battery electric vehicles and plug-in hybrid electric vehicle) "in 2021 and 2022".

Country	BATTERY ELECTRIC VEHICLES (BEV) ¹		PLUG-IN HYBRID ELECTRIC VEHICLES (PHEV)		Total 2022 (BEV + PHEV)
	2021	2022	2021	2022	
Germany	356 425	471 394	325 449	362 093	833 487
France	162 167	203 122	141 001	126 547	329 669
Sweden	57 473	95 035	77 853	66 614	161 649
Italy	67 284	49 179	69 834	65 580	114 759
Netherlands	63 780	73 394	30 991	34 512	107 906
Belgium	22 677	37 638	47 753	59 281	96 919
Spain	23 689	30 545	43 227	47 788	78 333
Denmark	24 998	30 855	40 476	26 442	57 297
Austria	33 380	34 179	14 626	13 268	47 447
Portugal	13 260	17 817	15 660	16 026	33 843
Finland	10 153	14 530	20 140	16 171	30 701
Ireland	8 646	15 678	7 891	7 678	23 356
Poland	7 166	11 334	9 138	9 664	20 998
Romania	6 342	11 638	0	0	11 638
Luxembourg	4 650	6 393	4 443	3 847	10 240
Hungary	4 312	4 710	4 236	4 874	9 584
Greece	2 176	2 827	4 785	5 493	8 320
Czechia	2 655	3 895	3 736	3 560	7 455
Slovakia	1 105	1 391	1 166	1 556	2 947
Slovenia	1 723	2 293	308	590	2 883
Croatia	1 351	1 369	399	836	2 205
Lithuania	1 158	1 358	400	666	2 024
Latvia	414	1 068	137	301	1 369
Estonia	484	731	239	426	1 157
Bulgaria	433	1 002	117	141	1 143
Cyprus	84	403	98	228	631
Total EU 27	877 985	1 123 778	864 103	874 182	1 997 960

1. Includes fuel cell electric vehicles (FCEV type). Note: Only countries for which sourced data is available are listed (Data for Malta not available). Source: ACEA (European Automobile Manufacturers Association).



PART 2: RENEWABLE ELECTRICITY IN TRANSPORT RENEWABLE ELECTRICITY CONSUMPTION IN TRANSPORT RISING ALL THE TIME

Since 2021, the Renewable Energy Directive 2018/2001 rules have applied to the calculation of the EU's renewable electricity consumption in transport, when the possibility of calculating it from the European Union's production mix was abolished. Thus, individual Member States must refer to the previous two-year period prior to the current year when the electricity was supplied on their territory (normalized electricity output for wind power and hydropower), which also applied in the previous directive.

The initial data collected or estimated by EurObserv'ER for 2022, shown in table 4 puts renewable electricity consumption in transport at 2.2 Mtoe (equating to 25.9 TWh of electricity consumption), i.e., a YoY increase of about 18.4%. This sharp rise can be attributed to the combination of rail transport's recovery, the surge in electric vehicle (EV) sales and the increase in the renewable electricity share of electricity production between the two reference years (i.e., 34.1% in 2019 and 37.4% in 2020). In detail, renewable electricity consumption in road transport enjoyed the greatest growth at about 71% rising to 404.6 ktoe between

2021 and 2022. Growth in the railway sector's electricity consumption is put at about 11.2% over the same period, at around 1.5 Mtoe. It should be noted that in some countries, a substantial share of renewable electricity consumption in transport is not distinctly tracked but allocated to the "other means of transport" category by default.

6 MILLION RECHARGEABLE ELECTRIC VEHICLES IN THE EU AT THE END OF 2022

Data released by the European Automobile Manufacturers' Association (ACEA) presented in table 5 shows that new Battery Electric Vehicle registrations in the European Union increased by 28% between 2021 and 2022 rising from 877 985 to 1 123 778 registrations, while those of rechargeable hybrid petrol or diesel light-duty vehicles (or PHEVs - Plug-in Hybrid Electric Vehicles) only increased by 1.2% YoY from 864 103 to 874 182 registrations. Hence, 2 million rechargeable light-duty vehicles (1 997 960 units) were put into circulation during 2022 compared to 1 742 088 in 2021. The rechargeable EV market share of total light-duty vehicle sales thus rose to 21.6% in 2022 (12.1% for 100% EVs and 9.5% for rechargeable hybrids) while the figure stood at just 18.0% in 2021 (9.1% and 8.9% respectively). The market share of non-rechargeable hybrid light-duty vehicles, namely those vehicles

The Nîmes Pont du Gard railway station car park with photovoltaic canopies has 550 bays and started generating power in 2021. The 8 000 m² of solar panels generate 1.95 million kWh per annum. 80 of the bays are fitted with EV charging points.

with a small battery that automatically recharges during the braking and deceleration phases using the vehicle's inertia, is a little higher at 22.6% in 2022 (19.8% in 2021). While this category of vehicles offers an improvement over thermal vehicle performances, their renewable electricity consumption is excluded from the transport figures as this consumption only derives from the biofuel share of the petrol or diesel used. As for data on the total fleet of rechargeable EVs in circulation, be they light passenger vehicles (M1) or light utility vehicles (N1), the European Alternative Fuels Observatory (EAF0) put their number at just over 6 million at the end of 2022 (3.3 million BEVs and 2.7 million PHEVs) and said that this number had risen to 5.3 million by the end of June 2022 (2.9 million BEVs and 2.4 million PHEVs). Removing the EU's 250 million thermal light-duty vehicles from circulation will take time, but transition to the electrification of road transport has kicked off.



Tabl. n° 6

Alternating current (AC) and Direct Current (DC) public recharging points installed in the European Union countries in 2021 and 2022

Country	2021			2022		
	AC Public recharging points ¹	DC Public recharging points ²	Total	AC Public recharging points ¹	DC Public recharging points ²	Total
Netherlands	82 628	1 670	84 298	110 982	2 731	113 713
Germany	50 856	6 934	57 790	70 921	12 639	83 560
France	51 022	3 631	54 653	75 097	8 220	83 317
Italy	19 783	1 489	21 272	27 490	3 243	30 733
Sweden	16 987	1 420	18 407	21 894	2 458	24 352
Belgium	11 976	528	12 504	22 614	894	23 508
Spain	7 255	1 639	8 894	18 675	3 797	22 472
Austria	10 446	1 291	11 737	15 183	2 272	17 455
Denmark	5 386	458	5 844	9 923	920	10 843
Portugal	3 080	596	3 676	5 202	1 307	6 509
Finland	4 054	516	4 570	4 504	1 010	5 514
Czechia	1 371	618	1 989	2 673	1 015	3 688
Poland	1 973	526	2 499	2 568	819	3 387
Hungary	2 297	339	2 636	2 868	455	3 323
Luxembourg	1 020	9	1 029	2 254	109	2 363
Ireland	776	197	973	1 972	272	2 244
Slovakia	1 033	209	1 242	1 696	525	2 221
Slovenia	1 052	176	1 228	1 365	231	1 596
Romania	801	283	1 084	1 066	418	1 484
Croatia	523	272	795	764	352	1 116
Bulgaria	443	171	614	761	271	1 032
Greece	597	14	611	943	38	981
Latvia	204	155	359	319	180	499
Lithuania	71	56	127	363	55	418
Estonia	49	143	192	97	177	274
Malta	95	0	95	95	0	95
Cyprus	60	0	60	67	0	67
Total EU 27	275 838	23 340	299 178	402 356	44 408	446 764

1. Total number of publicly accessible AC recharging points, according to the AFIR categorization, Slow AC recharging point, single-phase ($P < 7.360W$), Medium-speed AC recharging point, triple-phase ($7.360W \leq P \leq 22.080W$), Fast AC recharging point, triple-phase ($P > 22.080W$). 2. Total number of publicly accessible DC recharging points, according to the AFIR categorization, Slow DC recharging point ($P < 49.950W$), Fast DC recharging point ($49.950W \leq P < 150.000W$), Level 1 - Ultra-fast DC recharging point ($150.000W \leq P < 349.000W$), Level 2 - Ultra-fast DC recharging point ($P \geq 349.000W$). Source: Data gathered by the European Alternative Fuels Observatory 2023 (except Czechia for the year 2022).

OVER 600 000 CHARGING STATIONS ARE ALREADY IN SERVICE IN 2023

The European Union's network of public charging stations is becoming denser through public authority efforts. The EAFO's data shows that the number of public charging locations installed in the EU rose by about 49.3% between 2021 and 2022 (from 299 178 to 446 764) (table 6). The installation pace has not slackened and at the end of Q3 2023, their number had risen to 613 314 including 73 812 that deliver DC directly. This type offers much faster charging times than stations that deliver AC (see inset). Public DC EV charging stations are expensive installations primarily meant for charging EVs travelling on

long-distance journeys, so they tend to be found at motorway filling stations or are provided by some shopping centres.

This rapid increase across the European Union hides some disparity, as networks are still very incomplete in some countries, while others such as Germany, France and the Netherlands have been fast to roll them out. In 2022, these three Member States shared 62.8% of the European Union's public charging stations and 53.1% of the fast DC charging stations between them. The rollout of public charging stations is being actively pursued by Italy (30 733 charging stations, 44.5% YoY rise), Sweden (24 352 charging stations, 32.3% YoY rise) and Belgium (23 508 charging stations, 88.0% YoY rise). Spain is also

making up for lost time with 22 472 new charging stations, amounting to 152.7% growth in 2022.

FIT FOR 55 – THE TRANSPORT CHAPTER COMES INTO EFFECT

Following long legislative work initiated by the "Fit for 55" package, the first texts agreed to set up instruments to reduce GHG emissions in transport were published in the OJEU during 2023, while others are about to be published. These pieces of legislation relate to the implementation of a separate emissions trading scheme (ETS) for road transport, buildings and other sectors (not covered by



OVERVIEW OF THE OTHER PIECES OF TRANSPORT DECARBONISATION LEGISLATION

The EU emission trading system (EU ETS) is the main instrument available to reduce GHG emissions, which assigns a price to carbon. The various entities within the system must buy emissions permits that correspond to their GHG emissions. The number of tradable emissions permits is capped annually, and this cap is lowered from year to year to create financial incentives to encourage companies to reduce their emissions. Reforming the system not only introduced more ambitious emission reduction targets with a new reduction target of 62% below the 2005 level to the 2030 timeline (as opposed to 43% reduction prior to the reform), but also faster reduction of the permit cap launched every year (4.3% less per annum between 2024 and 2027 and 4.4% between 2028 and 2030, compared to an annual 2.2% drop from 2024 to 2030 prior to the reform).

Since the reform, the ETS covers new sectors, i.e., it has been extended to cover maritime transport from 2024 onwards (to be phased in between 2024 and 2026) and the rollout of a separate ETS for building, road transport and fuels for additional sectors. This separate ETS directly governs the upstream side of the building, road transport and other sectors (i.e., the industrial installations of the energy sector from ferrous metal production and processing, the mineral industry and paper pulp, paper and fibreboard manufacturing not covered by the existing ETS), or fuel suppliers. The latter will be obliged to declare the quantity of fuel placed in the market and annually surrender the emissions permits to match the carbon intensity of the fuels. This ETS Mark 2 will be fully effective in 2027 or 2028 if energy prices are inflated. It is planned that part of the revenue generated by this ETS will be paid into the Social Fund for the climate (to support the most vulnerable individuals and businesses from the effects of the carbon pricing of this new ETS).

As regards road transport, Regulation (EU) 2023/851 dated 19 April 2023, was finally jointly adopted by the European Parliament and the European Council and published in the OJEU on 25 April 2023. The target for new passenger and light commercial vehicles is to achieve zero CO₂ emissions by 2035. An interim emissions reduction target was set at 55% for cars and 50% for vans by 2030. Although at the end of the legislative process, the text of the regulation was approved during a plenary session in mid-February 2023 and had been cleared by all the Member States, thereby imposing 100% electric drive vehicles from the middle of the next decade, Germany persuaded the European Council to amend regulation in-extremis, making it possible to register combustion engine equipped cars after 2035 provided that they exclusively use CO₂ emission neutral fuels. This proposal, defended by the elite car manufacturers, paves the way to using hydrogen-based synthetic fuel (e-fuel). As regards heavy-duty vehicles, that are responsible for over 25% of road transport related GHG emissions in the EU, the mobility chapter of the Green Deal includes the revision of Regulation (EU) 2019/1242 that lays down the CO₂ emission standards for newly registered heavy-duty vehicles. The current regulation provides for a 30% reduction in CO₂ emissions in 2030, with an interim 15% reduction target in

2025. On 16 October 2023, the European Council endorsed a sector-wide 15% target for emissions reduction by 2025, 45% by 2030, 65% by 2035, and 90% by 2040. This target means that the industry will be able to continue manufacturing a limited number of combustion drive lorries and buses, while it is developing electric or hydrogen-fuelled heavy-duty vehicles at the same time. As for the zero emission buses target, the European Council managed to postpone the zero emission vehicles (electric or hydrogen) target. Its intended European Commission 100% target share of new urban buses as early as 2030 will no longer apply. It has dropped to 85%, thus postponing the 100% zero-emission buses target until 2035. This general direction will constitute the Council's negotiating mandate with the European Parliament for formulating the definitive text of the legislative act. The Council and Parliament should formally adopt the result of the negotiations.

Regulation (EU) 2023/1805 on the use of renewable and low-carbon fuels in maritime transport was adopted by the European Council on 25 July and appeared in the OJEU on Friday 22 September 2023. The text aims to gradually phase out the fuel related GHG emissions from vessels with a gross tonnage above 5 000 tonnes used for passenger or goods transport for commercial purposes. The limit is calculated by subtracting the percentage depending on the reference value of 91.16 grammes CO₂ equivalent per MJ. This new regulation imposes carbon intensity targets of the energy used on board vessels, calculating the full fuel lifecycle. The targets are as follows, a 2% reduction from 2025 onwards, 6% from 2030, 14.5% from 2035, 31% from 2040, 62% from 2045 and 80% from 2050.

The ReFuelEU Aviation regulation, that was adopted by the European Council on 9 October 2023, and which should shortly be published in the OJEU, will oblige the EU's aviation fuel suppliers to increase the proportion of sustainable fuels (and synthetic fuels in particular) that they distribute. The minimum sustainable aviation fuel share will increase by 2% in 2025, 6% in 2030, 30% in 2035, 34% in 2040, 42% in 2045 and 70% in 2050. Regulation (EU) 2023/1804 dated 13 September 2023 on the deployment of an alternative fuels infrastructure (repealing Directive 2014/94/EU) was published in the OJEU on 22 September 2023. It sets binding national targets that will lead to the rollout of sufficient infrastructures for alternative fuels in the EU for road vehicles, trains, ships and stationary aircraft.

As regards light-duty vehicles, light EVs (electric vehicles, utility vehicles and vans) will have to be able to find a charging station open to the public, with at least 400 kW of power output and there will have to be at least one charging point offering at least 150 kW every 60 km along the EU's main corridors that form the Trans-European Transport Network (TEN-T) or less than 3 km from the nearest exit, no later than 31 December 2025. By the same deadline, every charging location must supply at least 600 kW of total output and comprise at least two charging points with at least one 150 kW charger available. The Member States must also provide minimal charging point coverage open to the public and reserved for use by heavy-duty EVs on their territory.



the existing ETS), infrastructure targets for EVs and substitution fuel, emissions reduction targets for light-duty vehicles in road transport, emissions reduction for heavy-duty vehicles, targets for the use of renewable and low carbon fuels in maritime (FuelEU maritime) and air (ReFuelEU aviation) transport. The high point is the eagerly awaited recast Renewable Energy Directive, directive 2023/2413 (known as RED III), which was

finally adopted and published in the OJEU on 31 October 2023. RED III clearly raised the European Union's renewable energy targets to bring them in line with the European Union Green Deal that set 2050 as the EU's climate-neutral target date. It sets an interim target of reducing net GHG emissions of at least 55% from 1990 levels by 2030, and also aligns the targets with the RePowerEU Plan outlined in the Commission's communication of

18 May 2022 that aims to end the EU's dependence on Russian fossil fuels long before 2030. Broadly speaking, the new directive raises its renewable energy share targets of the EU's gross final electricity consumption in 2030 from at least 32 to 42.5% and encourages the Member States to aim for 45%.

As for the transport chapter, it offers the Member States more flexibility by allowing them to choose between two goals – either a binding goal of reducing GHG intensity in transport by 14.5% resulting from the use of renewable energies by 2030, or a binding renewable energy share of at least 29% in the transport sector's final renewable energy consumption by 2030. Thus, based on the reference value EF(t) for fuel or fossil fuel set at 94 gCO₂eq/MJ, in compliance with an indicative trajectory set out by the Member State; or a binding renewable energy share of at least 29% in the transport sector's final renewable energy consumption by 2030. This second target is much more ambitious than its predecessor, RED II, that aimed at a binding renewable energy share of at least 14% in the transport sector's final renewable energy consumption in 2030. The binding target for reducing GHG intensity resulting from renewable energies appears to be much more accessible and should logically be given preference in many Member States. Sweden and Finland, which have the highest RES shares in their transport, believe that they should have no difficulty achieving their renewable energy share targets.

The new RED III rules furthermore establish a combined binding sub-target of 5.5% in 2030 (and an interim target of 1% in 2025) for advanced biofuels and biogas (produced from the non-food raw materials listed in Annex IX, part A) and renewable fuels of non-biological origin (mainly renewable hydrogen and hydrogen-based synthetic fuels) in the share of renewable energies supplied to the transport sector. This target has a minimum requirement of 1% of RFNBOs in the share of renewable energies supplied to the transport sector in 2030.

The recast directive also retains the limit on the use of fuels produced from human and animal food crops. Their use must not exceed more than one percentage point of the share of these fuels in a Member States' transport sector's final energy

consumption in 2020, with a maximum 7% share of final energy consumption in that Member State's transport sector. It also retains the provision limiting the share of biofuels and biogas produced from the raw materials listed in Annex IX, part B (namely used cooking oils and animal fats) to 1.7% in the energy content of fuels and electricity supplied to the transport sector, with the exception of Cyprus and Malta. Nonetheless, the Member States may increase this limit, when justified by the availability of the raw materials in question, providing they submit any increase for approval by the European Commission. A minor accounting nuance has been added to deter countries from agrofuel consumption. This is because when the share of biofuels produced from human and animal food crops in a Member State, is capped at less than 7% or a Member State decides to limit this share even further, it can consequently reduce the minimum share of renewable energy as a or the GHG intensity reduction target, on the basis of the contribution that these fuels would have had on the minimum share of renewable energy or GHG emissions reductions. The main calculation rules have not been changed to calculate the target's numerator. Recycled carbon-based fuels can be included as well as a certain number of incentives. The share of biofuel and biogas produced from the raw materials listed in Annex IX and the share of renewable fuels of non-biological origin are considered to equate to twice their



In October 2023, the 1000th BioNGV bus went into service in the RATP network.

Sources used : Ministry of Ecological Transition-SDES (France), AGEE-Stat (Germany), Ministry for the Ecological Transition (Spain), GSE (Italy), Statistics Netherlands, Federal Public Service Economy-FPS (Belgium), Statistics Austria, Statistics Sweden, Ministry of Industry and Trade (Czechia), DGE - General Directorate of Energy and Geology (Portugal), NSI (Bulgaria), STATEC (Luxembourg), Statistics Lithuania, CSB (Latvia), Statistics Estonia, Statistical office (Slovenia), EAFO, ACEA, Eurostat, EurObserv'ER

energy content; the renewable electricity share is considered to equate to four times its energy content when intended for road transport and can be considered to equate to 1.5 times its energy content when intended for rail transport. The share of advanced biofuel and biogas produced from the raw materials listed in Annex IX, part A, supplied in air and maritime transport modes is considered to equate to 1.2 times their energy content, and the share of renewable fuels of non-biological origin is considered to equate to 1.5 times their energy content supplied in air and maritime transport modes. □

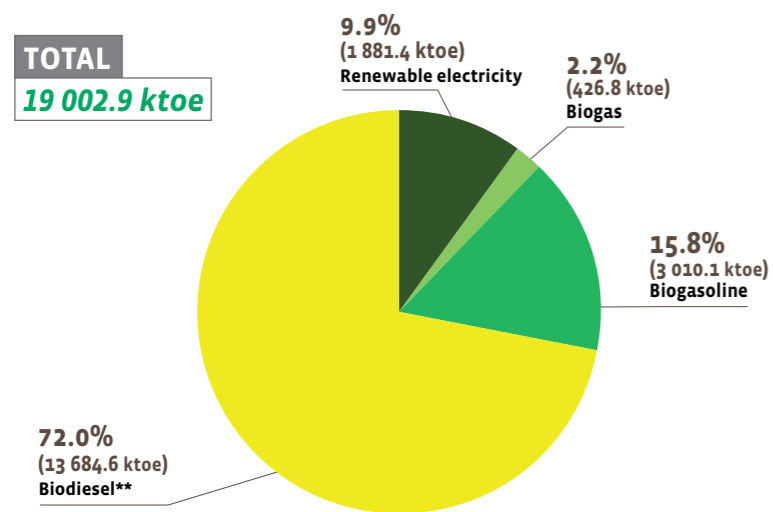
The next barometer will cover solid biofuels



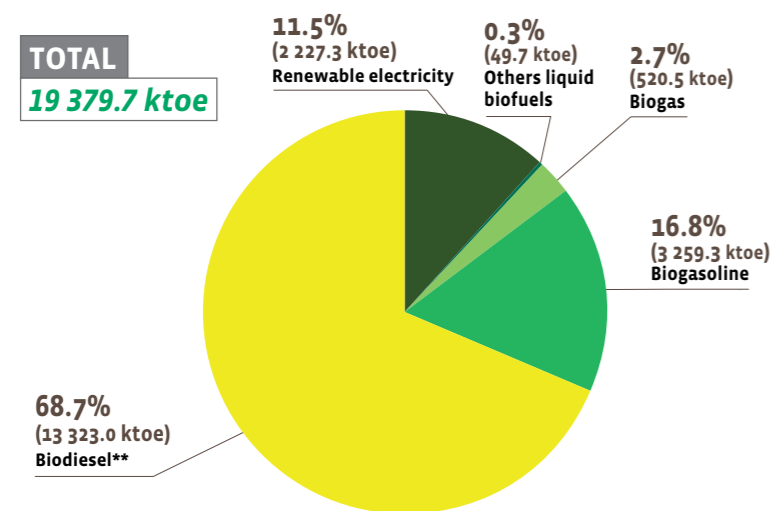
This barometer was prepared by Observ'ER in the scope of the EurObserv'ER project, which groups together Observ'ER (FR), TNO (NL), RENAC (DE), Fraunhofer ISI (DE), VITO (BE) and CBS Statistics Netherlands (NL). This document has been prepared for the European Commission however it reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Graph. n° 2

Breakdown of renewable energy used in transport (all types) of the countries of the European Union to 27 (in ktoe and %) in 2021



Breakdown of renewable energy used in transport (all types) of the countries of the European Union to 27 (in ktoe and %) in 2022*



*Estimation. **Including HVO. Source: EurObserv'ER 2023 .

