+ 6.3 %

The increase of renewable energy consumption for transport in the EU27 between 2022 and 2023 (in energy content)

RENEWABLE ENERGY IN TRANSPORT BAROMETER

A study carried out by EurObserv'ER.

The renewable energies used in transport essentially originate from biofuels blended with petrol and diesel fuels, as well as biogas used in vehicles that run on natural gas and biokerosene used in aviation. Renewable electricity is also used, albeit to a lesser extent, mainly in rail transport and increasingly in road transport, with an uptake in the ownership of 100% rechargeable electric and hybrid vehicles. Preliminary EurObserv'ER data suggests that renewable energy consumption in European Union transport, be it road, rail, maritime or air, powered by combustion or electric engines, increased by about 6.3% between 2022 and 2023, to almost 20.9 Mtoe. The renewable energy share used in EU's transport sector should easily pass the 10% mark in 2023 and outperform the 9.6% share measured in 2022.

Neste and Airbus have joined forces to promote the use of a 100% sustainable aviation fuel. Neste's MY Sustainable Aviation Fuel is produced from waste and 100% renewable raw materials obtained from sustainable sources – primarily spent cooking oil and animal fat waste. The SAF is blended with conventional kerosene before use.

27.5 TWh (eq 2.4 Mtoe)

Renewable electricity used in transport (road, rail, other transport modes) in the EU27 in 2023

18.5 Mtoe

Total biofuel consumption in EU27 transport in 2023

Transport decarbonisation is one of the key climate change challenges, which when all elements are taken together – road, air, rail or maritime – amounts to about a quarter of all the European Union's GHG CO_2 equivalent emissions (including CO_2, CH_4, N_2O and HFC). Given the technological choices to be implemented over the long term and the implications for the European transport industry and economy facing extremely aggressive international, and especially Chinese competition, this challenge is also a strategic European Union policy topic.

THE RES SHARE IN TRANSPORT PASSED 10% IN 2023

Although European renewable energy legislation changed in 2023, the calculation rules set by the 2023/2413 (RED III) directive will only come into force from 2025 onwards. Since 2021 until the end of 2024, the 2018/2001 (RED II) directive calculation rules apply to calculating the renewable energies shares in transport. When this barometer was being written in November 2024, the European Union-wide 2023 share was yet to be officially finalized. However, according to EurObserv'ER, which bases its figures on the calculations and preliminary data of certain Member States and takes into account the incentives for using advanced biofuels and renewable electricity in road and rail transport, the renewable energy share of the EU transport sector should have no trouble rising above 10% in 2023, but not exceed 11%.
Preliminary data from the European Environment Agency, published on 31 October 20241, points to a 10.1% RES share in transport in 2023, with RES shares ranging from 4% for Latvia and Croatia to 29.5% for Sweden. The figure is 3.9 percentage points below the initial 14% target for 2030 set in the 2018/2001 directive. The EEA explains that the deadline for receiving most of the data sources included in its calculations is the 31st of July of the publication year. The preliminary data gathered by EurObserv'ER in November suggests that the RES share in transport should be a little higher. This share, based on the first available official estimates from the various Member States between 2022 and 2023, should rise from 11.1 to 11.9% in Germany, from 9.0 to 9.9% in France, from 9.7 to 12% in Spain, from 8.7 to 11.2% in Portugal, from 11.1 to 13.4% in the Netherlands, from 10.4 to 12.1% in Belgium, from 10.1 to 13.2% in Austria, and from 10.4 to 10.8% in Denmark. We recall that the Eurostat SHARES tool reported that the RES share in transport across the European Union increased by 9.1% in 2021 to 9.6% in 2022, against the backdrop of the post Covid-19 pandemic rebound in transport activity.

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, which will be enabled by extending electrification of road transport and by halting sales of combustion engine powered vehicles from 2035. 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 legislation 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. Furthermore, the Commission has adopted the ReFuelEU regulations for aviation and FuelEU regulations for maritime transport as part of the "Fit for 55" package, which aim to stimulate the adoption of renewable and low-carbon fuels in these transport modes (see further on).

The driving range of the new ë-C3 or electric C3 in its most classic version is about 320 km. Optimum charging (20-80% of the battery) takes 20 minutes for the 44-kWh version from a fast 100-kW public charging station and about 7 hrs at a reinforced domestic power socket (power rating of 3.7 kW).

PART 1: BIOFUEL AND BIOGAS IN TRANSPORT

The data gathered by EurObserv'ER supports the theory that all the liquid and gaseous biofuels as well as renewable electricity contributed to increasing renewable energy consumption during 2023. Liquid and gaseous biofuels used in combustion engines drove most of this increase with just under an extra 1.1 Mtoe between 2022 and 2023 of the total consumption of 18.5 million toe. Biodiesel, adding 771.3 ktoe, was the main contributor, ahead of biopetrol with 187.5 ktoe, biogas with 65.7 ktoe and the other fuels such as biokerosene for aviation also with 65.7 ktoe. Biokerosene use is picking up because new dedicated production capacities have been commissioned on specific industrial sites (see further on). Incidentally, the biogas fuel consumption statistics include the consumption of biomethane injected into the natural gas grid that is declared as being used in the transport sector.
Going into detail, biodiesel consumption 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", increased by 5.7% year-on-year across the European Union to just over 14.3 Mtoe. In 2023, Spain led the way, increasing its biodiesel consumption by 35%, which equates to 464.6 ktoe growth (source: Ministry for the Ecological Transition). Rises were also recorded in France (5.9%, or 131.5 ktoe), Italy (4%, or 54.2 ktoe), and Austria (12.5%, or 44 ktoe).
Biopetrol (bioethanol, synthetic biopetrol) consumption was boosted by growing demand for petrol that mechanically led to higher incorporation volumes in several countries. According to EurObserv'ER, YoY growth in biopetrol consumption was about 5.6%, amounting to 3.5 Mtoe. Italy led the way in 2023. The Italian agency, Gestore dei Servizi Elettrici (GSE), claims that it registered about 140% growth with 49 ktoe of additional consumption. Consumption in Austria enjoyed significant growth as it almost doubled (by 93.5%, or 48.2 ktoe). The strong growth in biopetrol consumption in these two countries can be put down to their relatively low consumption levels in 2022. Rises in biopetrol consumption were also recorded in Germany (5.1%, or 39 ktoe) and Spain (28.1%, or 33.3 ktoe)
Biogas fuel also performed well across the European Union. Its consumption grew by 13.4% over its 2022 level to reach 558.8 ktoe. This trend stems from the fact that several countries, primarily Sweden and Italy, adopted policies allotting most of their biomethane output to the transport sector and promoting the use of biomethane (BioNGV) and liquefied biomethane (BioLNG) fuels. European Alternative Fuels Observatory

data (EAFO) shows that at the end of 2023, Italy had a fleet of 1.1 million M1 passenger and N1 light utility vehicles with natural gas (NGV) motorization, and thus 100% compatible with biomethane. The Italian fleet comprises 78.4% of all vehicles of this type on the road in the European Union. Growth was particularly strong in 2023, in Italy where biomethane consumption increased by 20% (37 ktoe) and in Germany by 36.3% (33 ktoe). Sweden and the Netherlands bucked the trend as their consumption decreased by 2.7%, or 3.3 ktoe and 8.9%, or 3.6 ktoe, respectively.

The "other biofuels" category is basically confined to the biokerosene used in aviation and a small amount of vegetable oil biofuel. EurObserv'ER reports that France and the Netherlands were the prime movers behind the almost twofold rise (from 56.3 to 122 ktoe) in "other biofuel" consumption between 2022 and 2023.

INVESTMENTS IN ADVANCED BIOFUELS PICKING UP SPEED

The build-up in advanced biofuels can be attributed to the rollout of the Renewable Energy Directive (EU) 2018/2001 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. Advanced renewable fuels are produced from waste, residues or non-food cellulose matter. The types of feedstock that make up advanced biofuels are listed in Annex IX, part A) of the Directive (EU) 2018/2001. EurObserv'ER believes that advanced biofuel consumption, which also encompasses the petrol sector (but to a lesser extent) should rise above 3 Mtoe in 2023 (2.8 Mtoe in 2022). This consumption figure excludes biofuels produced from cooking oils and animal fats, i.e., the raw materials listed in Annex IX, Part B of the Directive (EU) 2018/2001, that also benefit from a double incentive but in the quantities used is limited to 1.7% of the energy content of the fuels and electricity supplied to the transport sector. Incidentally, the final quantity of advanced biofuels used in the European Union had yet to be finalized in November, as several large consumer countries had not informed us of their consumption data for our study.

The considerable growth in advanced biofuel consumption can be explained by the major 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 (Hydrotreated Vegetable Oil) also known as HDRD (hydrogenation-derived renewable diesel) 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 2024. It claimed that EU HVO biodiesel output (including a small volume of sustainable fuel earmarked for aviation) profited from the rise and increased by 11% to 3.89 billion litres. It also expects HVO output in 2024 to increase by 8% to 4.19 billion litres on the basis of further expansion of production in Sweden and Italy.

Focussing on the three main HVO producers, Finland's 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 future plants should be fully operational in 2025 or a little later as Shell has temporarily halted construction work on its Rotterdam refinery. 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

Tabl. n° 1

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

Country	Biodiesel	Biogasoline	Biogas*	Others liquid biofuels***	Total	Compliant biofuels***
France	2 213.7	849.6	3.6	33.3	3 100.2	100.0%
Germany	2 200.0	761.0	91.0	3.0	3 055.0	96.2%
Sweden	1 404.8	150.8	120.3	0.0	1 675.9	100.0%
Italy	1 354.1	35.0	184.9	0.0	1 573.9	99.9%
Spain	1 327.6	118.6	0.0	0.0	1 446.2	100.0%
Poland	971.5	231.9	0.0	0.0	1 203.4	100.0%
Belgium	603.7	159.3	0.1	0.0	763.0	100.0%
Netherlands	299.9	251.1	40.7	20.0	611.7	100.0%
Finland	426.3	118.6	26.5	0.0	571.5	95.5%
Roumanie	414.8	143.9	0.0	0.0	558.7	100.0%
Austria	351.2	51.6	0.4	0.0	403.2	100.0%
Portugal	315.4	25.7	0.0	0.0	341.1	99.8%
Czechia	259.8	63.2	0.0	0.0	323.0	100.0%
Hungary	212.7	90.2	0.0	0.0	302.9	100.0%
Denmark	164.9	79.9	8.8	0.0	253.6	95.7%
Ireland	206.3	23.3	0.9	0.0	230.6	100.0%
Greece	149.5	67.9	0.0	0.0	217.3	74.0%
Bulgaria	165.2	20.9	0.0	0.0	186.1	98.4%
Slovakia	140.6	28.1	0.0	0.0	168.7	100.0%
Luxembourg	107.8	19.9	0.0	0.0	127.7	100.0%
Lithuania	99.9	19.7	0.0	0.0	119.6	100.0%
Slovenia	73.3	6.5	0.0	0.0	79.7	98.6%
Estonia	26.0	2.0	12.9	0.0	40.9	100.0%
Cyprus	24.9	0.0	0.0	0.0	24.9	100.0%
Croatie	20.8	0.2	0.0	0.0	21.0	100.0%
Latvia	5.6	10.1	0.0	0.0	15.8	100.0%
Malta	12.6	0.0	0.0	0.0	12.6	100.0%
Total EU 27	13 552.8	3 328.9	490.1	56.3	17 428.1	98.8%

** Including biomethane blended in the natural gas grid allocated to the transport sector with appropriate traceability requirements. ** Including biokerosene and vegetable oil. *** Compliant biofuels (articles 29 and 30 of Directive 2018/2001 EU). Note: Breakdown between types of biofuel has been estimated by EurObserv'ER.*
Source: EurObserv'ER 2024

Tabl. n° 2

Biofuels consumption for transport in the European Union in 2023 (in ktoe)*

Country	Biodiesel	Biogasoline	Biogas**	Others liquid biofuels***	Total	Compliant biofuels****
France	2 345.2	844.1	5.4	54.8	3 249.5	100.0%
Germany	2 197.0	800.0	124.0	3.0	3 124.0	97.4%
Spain	1 792.2	151.9	0.0	0.2	1 944.3	99.9%
Italy	1 408.2	84.0	221.8	0.0	1 714.1	100.0%
Sweden	1 363.1	115.0	117.0	0.0	1 595.1	100.0%
Poland	1 045.0	238.1	0.0	0.0	1 283.1	100.0%
Belgium	597.2	174.0	0.1	0.0	771.3	100.0%
Netherlands	289.1	257.5	37.1	63.1	646.8	100.0%
Finland	423.1	129.9	26.5	0.0	579.5	100.0%
Roumanie	414.8	143.9	0.0	0.0	558.7	100.0%
Austria	395.2	99.8	0.6	0.0	495.6	89.7%
Portugal	335.5	25.4	4.9	0.9	366.7	96.6%
Hungary	222.1	98.5	0.0	0.0	320.7	100.0%
Czechia	241.3	62.6	0.1	0.0	303.9	100.0%
Ireland	269.1	32.8	0.9	0.0	302.8	100.0%
Denmark	134.5	84.0	9.7	0.0	228.2	98.4%
Greece	149.5	67.9	0.0	0.0	217.3	100.0%
Slovakia	178.9	25.5	0.0	0.0	204.5	100.0%
Bulgaria	153.1	21.8	0.0	0.0	174.8	100.0%
Luxembourg	107.8	19.9	0.0	0.0	127.7	100.0%
Lithuania	98.7	19.4	0.0	0.0	118.1	100.0%
Slovenia	87.1	7.7	0.0	0.0	94.8	100.0%
Estonia	16.9	2.3	7.7	0.0	26.8	100.0%
Cyprus	22.4	0.0	0.0	0.0	22.4	100.0%
Croatie	20.8	0.2	0.0	0.0	21.0	100.0%
Malta	13.1	0.0	0.0	0.0	13.1	100.0%
Latvia	3.1	8.7	0.0	0.0	11.8	100.0%
Total EU 27	14 324.1	3 514.6	555.8	122.0	18 516.5	99.2%

** Estimation ** Including biomethane blended in the natural gas grid allocated to the transport sector with appropriate traceability requirements. *** Including biokerosene and vegetable oil. **** Compliant biofuels (articles 29 and 30 of Directive 2018/2001 EU). Note: Breakdown between types of biofuel has been estimated by EurObserv'ER.* ***Source: EurObserv'ER 2024***

RENEWABLE ENERGY IN TRANSPORT BAROMETER – **EUROBSERV'ER** – NOVEMBER 2024

UPM group's Lappeenranta HVO biodiesel refinery.
In Q1 of 2024, Spain's Repsol started producing HVO biodiesel at Cartagena. The refinery's annual production capacity is put at about 315 million litres. Repsol is said to be planning to start up further refineries at Puertollano (2025), Coruña (2027) and Tarragona (2027). In March 2024, Repsol and Bunge announced a partnership agreement to develop new opportunities for meeting the increasing demand for low-carbon feedstock in renewable fuel production.
Italy's annual HVO Biodiesel production capacity at the Eni plant in Venice should rise from about 510 to 770 million litres in 2024. Its actual output, which is lower than its capacity, was 325 million litres per annum. It should rise to 540 million litres as early as 2024. Following the model adopted for Venice, Eni has converted its petrol refinery at Gela, Sicily, into a renewable diesel production installation with annual capacity of 960 million litres, to produce at least 600 million litres per annum. Eni stopped importing palm oil for its Gela and Venice refineries in October 2022 to comply with European regulations. The plants now 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 production 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 renewable fuel and SAF output further to 2.5 million m3 in 2027 and to 5 million m3 (5 billion litres) in 2035. In order to achieve this, Preem plans to reconstruct its Lysekil plant to increase output from its current annual level of 530 000 m3 to 1.2 million m3 (1.2 billion litres) at a cost put at 5.5 billion SEK (474 million euros). Construction work on the plant will kick off in 2024 and end in 2027.
In April 2024, Finland's St1 and SCA commissioned a refinery to produce 250 million litres of HDRD/SAF at Gothenburg (Sweden). Frying oil, animal fats and tall oil fatty acids will probably be its feedstock, the latter sourced from SCA's paper and paper pulp plants.
Advanced biofuel projects for cellulosic ethanol are in the pipeline. By way of example, Poland's oil company, **the ORLEN Group**, announced on 1 March 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 could be up and running in 2028, to produce 80 million litres of ethanol annually from wood. **BioEnergo** 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. Since 2022, Eni has been supplying Rome Fiumicino airport with kerosene blended with renewable feedstock. The kerosene is produced by a co-firing process in the Taranto refinery with 0.5% of spent cooking oil. The Eni refinery in Livorno is earmarked to produce about 12 million litres by using biocomponents produced in the Gela and Venice biorefineries by 2024.
In Spain, CESPA plans to open an SAF and an HVO biodiesel refinery, while Repsol will be opening a 500 million litre plant in 2027. In Portugal, Galp has announced that it will be constructing a 240 million litre capacity SAF refinery adjacent to its Sines refinery to process spent cooking oil.

Tabl. n° 3

Renewable electricity used in transport (road, rail, other transport modes) in 2022 and 2023 (in ktoe)*

	2022				2023*			
Country	Ren. electricity in road transport	Ren. electricity in rail transport	Ren. electricity in all other transport modes	Total	Ren. electricity in road transport	Ren. electricity in rail transport	Ren. electricity in all other transport modes	Total
Germany	93.3	445.0	50.5	588.8	147.1	433.9	47.5	628.5
Italy	19.1	182.6	92.8	294.4	25.5	172.6	87.7	285.7
Sweden	72.4	170.3	20.0	262.7	86.1	173.2	20.3	279.7
Austria	28.7	125.1	92.7	246.5	28.1	116.1	97.4	241.6
France	30.1	175.8	25.0	230.9	40.5	171.1	24.3	235.9
Spain	20.3	120.8	8.5	149.6	32.1	131.1	9.1	172.3
Netherlands	42.5	39.2	0.0	81.7	69.2	47.9	0.0	117.1
Denmark	23.2	28.0	0.0	51.2	31.6	30.8	0.0	62.4
Belgium	12.7	31.7	5.0	49.4	24.1	32.8	2.6	59.5
Poland	2.3	46.4	0.2	48.9	4.6	49.0	0.2	53.9
Roumanie	8.3	37.6	0.9	46.8	12.5	37.0	0.9	50.4
Finland	13.6	23.4	0.0	37.0	16.8	23.5	0.0	40.3
Portugal	2.0	22.6	0.3	24.9	4.6	24.4	0.4	29.5
Czechia	1.3	20.6	1.0	22.9	1.6	20.1	0.8	22.5
Hungary	1.2	12.0	0.1	13.4	2.0	13.8	0.1	15.9
Croatie	0.6	11.2	1.6	13.4	0.8	11.1	1.6	13.5
Slovakia	0.5	9.9	2.8	13.2	0.8	9.7	2.7	13.2
Ireland	5.3	1.6	0.0	7.0	7.5	1.5	0.0	9.1
Bulgaria	0.9	8.2	0.3	9.4	1.1	7.4	0.2	8.7
Slovenia	0.8	7.3	0.2	8.3	1.2	7.3	0.2	8.7
Greece	0.6	5.7	0.0	6.3	1.0	5.7	0.0	6.7
Latvia	1.6	3.0	0.1	4.6	2.1	2.9	0.1	5.0
Luxembourg	0.6	1.7	0.0	2.2	0.9	1.7	0.0	2.6
Lithuania	1.0	0.2	0.4	1.6	1.7	0.2	0.4	2.3
Estonia	0.5	0.3	0.0	0.8	0.8	0.3	0.0	1.1
Malta	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total EU 27	383.5	1 530.3	302.2	2 216.0	544.5	1 525.2	296.5	2 366.3

** 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 2024***

RENEWABLE ENERGY IN TRANSPORT BAROMETER – **EUROBSERV'ER** – NOVEMBER 2024

PART 2 : RENEWABLE ELECTRICITY IN TRANSPORT

CLEAR RISE OF RENEWABLE ELECTRICITY CONSUMPTION IN ROAD TRANSPORT

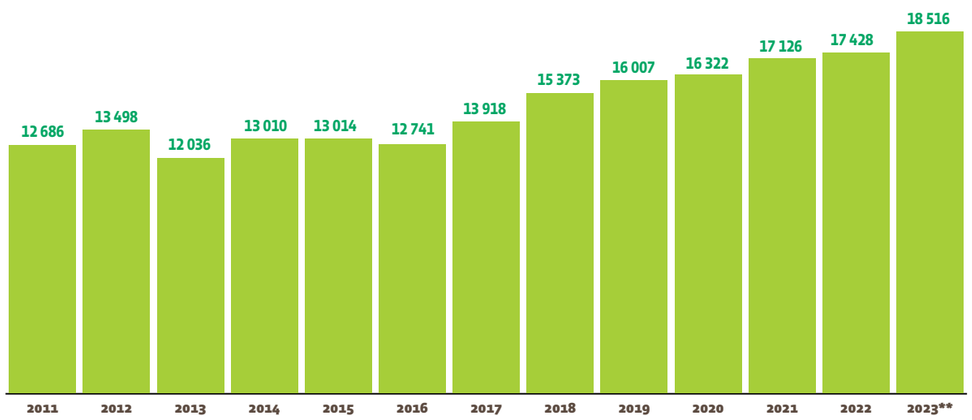
Before we address the issue of transport electrification, we should remind readers that since 2021, the Renewable Energy Directive 2018/2001 rules have applied to the calculation of the EU's renewable electricity consumption in transport and will be applied until the end of 2024. The Directive specifies that the calculation of renewable electricity consumption in transport must be based on the national electricity production mix (as the possibility of calculating it from the European Union's production mix has been curtailed). 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. So, to calculate the renewable electricity share used in transport in 2023, Member States must refer to their national electricity production mix for 2021, a year which was a bad year for renewable electricity production in many countries. As it happens, the renewable energy share of the European Union's electricity output only rose by 0.4 of a percentage point between 2020 and 2021 (from 37.4 to 37.8%), according to the Eurostat Shares tool and in 2021, 12 countries saw their renewable share of electricity output fall which all other things being equal, had an impact on the amount of renewable electricity used in transports. Examples are Germany (0.3 of a percentage point drop), Austria (a 4.2 percentage point drop), Italy (a 2.1 percentage point drop) and France (a 0.04 percentage point drop). Now, had actual consumption of renewable electricity used in transport been based on the renewable energy share of the European Union's non-normalized electricity consumption in 2023 (provisionally put at 44%) it would have been higher

The initial data collected or estimated by EurObserv'ER for 2023, assesses renewable electricity consumption in transport at 2.4 Mtoe (equating to 27.5 TWh of renewable electricity consumption), i.e., a YoY increase of about 6.7%.). Although rail transport

A new generation of chargers, such as the Tesla V4 superchargers are being rolled out across Europe. They promise to deliver a 1.2 MW charge for lorries and 500 kW for cars.

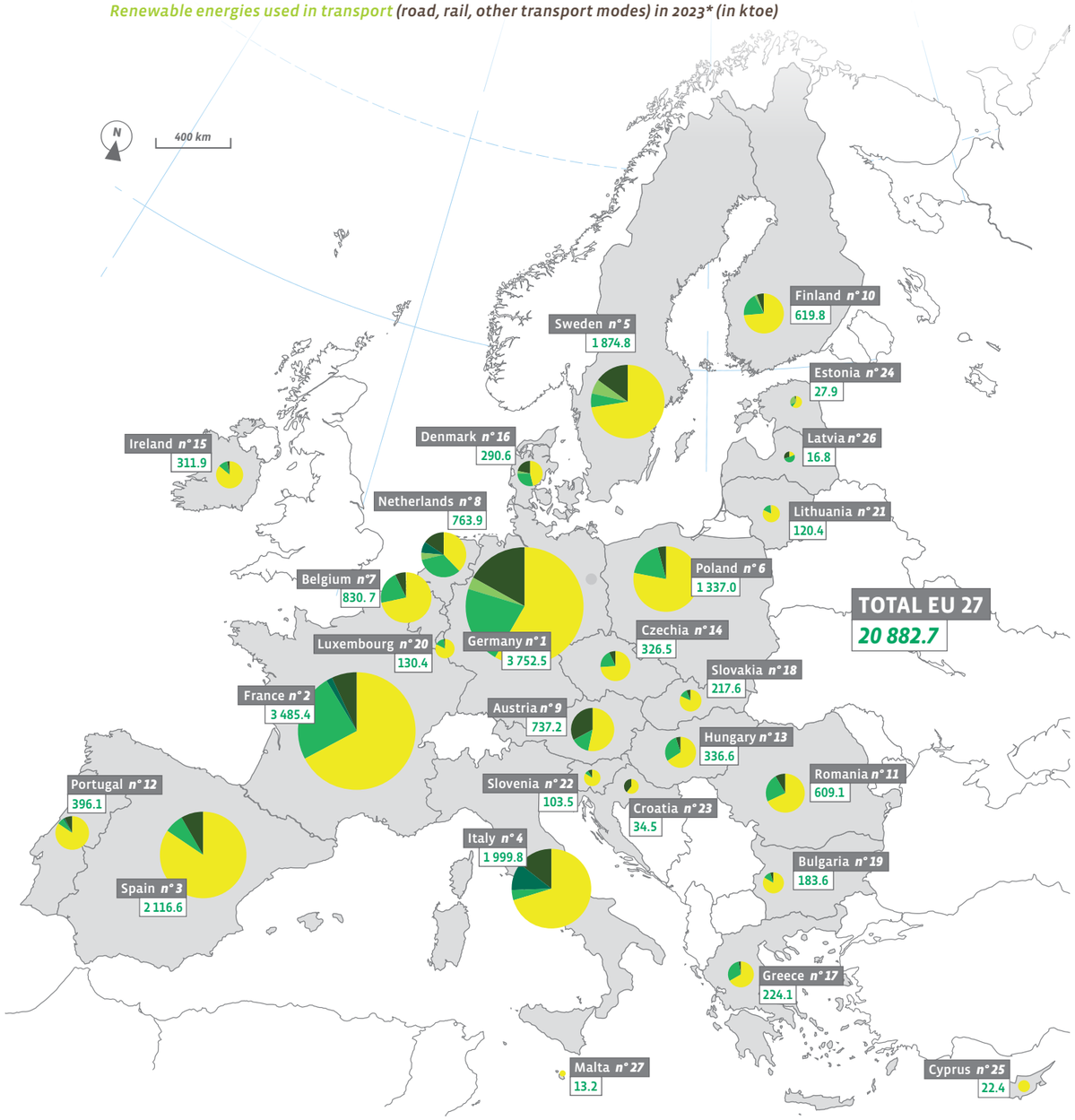
Graph. n° 1

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



** Compliant biofuel and not compliant. ** Estimation.* ***Source: Data from 2011 to 2021 (Shares Eurostat 2024); 2022-2023 (EurObserv'ER 2024)***

Renewable energies used in transport **(road, rail, other transport modes) in 2023* (in ktoe)**



Key

Country 20 882.7 — *Renewable energies used in transport (road, rail, other transport modes) in 2023* (in ktoe)*

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

** Estimation*
*** Including biomethane blended in the natural gas grid allocated to the transport sector with appropriate traceability requirements.*
**** Including biokerosene and vegetable oil.*
Source: EurObserv'ER 2024.

(train, underground, tramway) dominates renewable electricity consumption, the rise in renewable electricity consumption in 2023 was almost exclusively attributable to the increase in the number of electric vehicles on the road. EurObserv'ER feels that the relative stagnation of renewable electricity consumption in rail transport in the indicators presented in table 4 can be explained by an unfavourable reference year for calculations – 2021. We should also point out that in some countries, a considerable proportion of renewable electricity consumption in transport is not distinctly monitored and by default is assigned to the "other transport modes" category.

THE EU PASSES THE 10 MILLION RECHARGEABLE EV MARK

The European Automobile Manufacturers' Association (ACEA) data presented in table 5, shows that new European Union sales of "100%" battery-powered electric vehicles (BEVs) increased by 36.9% between 2022 and 2023 rising from 1 234 444 to 1 538 261 units. Plug-in petrol or diesel Hybrid Electric Vehicle (PHEV) registrations, dropped by 7% from 874 182 to 813 480 at the same time. So just under 2.4 million rechargeable passenger vehicles were put into circulation during 2023 compared to 2 million in 2022.
The rechargeable electric vehicle market share of total passenger vehicle sales rose to 22.3% in 2023 (14.6% for 100% EVs and 7.7% for rechargeable hybrid vehicles) compared to 21.6% in 2022 (12.1% for 100% EVs and 9.4% for rechargeable hybrid vehicles). In the rechargeable vehicle market segment, we observe an increasingly marked preference for 100% EVs and a declining interest in rechargeable hybrids.
Of more concern, the market share of the 100% EV segment decreased to 13.4% and that of hybrid rechargeable vehicle segment decreased to 7% over the first 10 months of 2024 (January to October), as indicated by the ACEA statistics, with a sharp drop in 100% EV sales in Germany. This situation can be explained by the German government's 16 December 2023 decision to discontinue awarding the EVs purchase bonus (of up to 4 500 euros per vehicle), starting on December 2023.
EurObserv'ER reckons that the stubbornly high purchase price of EVs, especially of those offering generous ranges (over 500 km) and capable of being fast charged are responsible for stifling the increase of the rechargeable vehicle market share. It is also hindered by the failure of European automobile manufacturers to launch smaller, more affordable models with less powerful batteries.
The market share of non-rechargeable hybrid private vehicles – cars with a small battery that exploits vehicle inertia to automatically charge during braking and deceleration – is higher, with a 25.8% share in 2023 (22.7% in 2022). This category is excluded from the renewable electricity consumption in transport figures. While their performances are better than combustion engine vehicles, their renewable energy consumption depends solely on the biofuel share of the petrol or diesel they use.
As for data on the total fleet of electric rechargeable vehicles on the road, of the (M1) passenger and (N1) light utility vehicle types, the European Alternative Fuels Observatory (EAFO) data puts their number at 8.2 million at the end of 2023 (4.7 million BEVs and 3.5 million PHEVs). According to the EAFO statistics, the 10 million mark for rechargeable vehicles was reached during 2024 when 6.2 million BEVs and 4.2 million PHEVs went out onto the road in the third quarter of the year. Taking the EU' s 250 million combustion engine passenger vehicles out of circulation will be a long process.

Tabl. n° 4

New passenger electric car registrations (battery electric vehicles and plug-in hybrid electric vehicle) in 2022 and 2023.

	BATTERY ELECTRIC VEHICLES (BEV)		PLUG-IN HYBRID ELECTRIC VEHICLES (PHEV)		Total 2022 (BEV +PHEV)
Country	2022	2023	2022	2023	
Germany	470 559	524 219	362 093	175 724	699 943
France	202 929	298 219	126 547	162 950	461 169
Belgium	37 619	93 285	59 269	100 308	193 593
Sweden	95 033	112 208	66 614	61 024	173 232
Netherlands	73 250	113 981	34 742	47 082	161 063
Italy	49 169	66 265	64 632	69 008	135 273
Spain	30 521	51 612	47 791	62 164	113 776
Denmark	30 822	62 759	26 440	17 283	80 042
Austria	34 165	47 261	13 268	16 956	64 217
Portugal	18 028	36 390	16 105	27 146	63 536
Finland	14 530	29 535	16 171	18 087	47 622
Ireland	15 678	22 789	7 678	10 382	33 171
Poland	11 291	17 078	10 443	13 171	30 249
Luxembourg	6 393	11 052	3 847	4 804	15 856
Romania	11 638	15 368	0	0	15 368
Greece	2 827	6 379	5 493	8 826	15 205
Czech Republic	3 944	6 700	3 447	5 251	11 951
Hungary	4 709	5 799	4 876	5 542	11 341
Slovenia	2 293	4 330	602	1 044	5 374
Slovakia	1 390	2 346	1 556	2 997	5 343
Croatia	1 369	1 637	836	992	2 629
Malta	984	1 248	1 234	950	2 198
Bulgaria	828	1 816	141	355	2 171
Lithuania	1 350	2 060	0	0	2 060
Latvia	1 073	1 692	295	363	2 055
Estonia	687	1 445	426	560	2 005
Cyprus	365	788	231	511	1 299
Total EU 27	1 123 444	1 538 261	874 777	813 480	2 351 741

Source: ACEA (European Automobile Manufacturers Association) 2024.

ENBW/ROLF OTZEN

In 2023, EnBW opened a fast charging station with a solar canopy at Großburgwedel, a few kilometres north of Hannover. The site comprises 32 high-power charging (HPC) charge points each offering maximum delivery of 300 kW.

OVER 800 000 CHARGING STATIONS ARE ALREADY IN SERVICE IN 2024

Electric vehicle charging stations are a key component of the infrastructure required for energy transition to more sustainable mobility. While most private vehicle charging relies on slow chargers that are ideal for overnight charging at home or while at work, public charging stations, whether fast or ultra-fast are essential for longer journeys. Charge point rollout accompanies the launch of new vehicle models. Super-fast charging stations can take about twenty minutes to charge a battery from 10 to 80% of its capacity. New-generation chargers, such as the Tesla V4 superchargers, are being installed in Europe promising delivery of a 1.2 MW charge for lorries and a 500 kW charge for cars. Although very few EVs can currently take such a high charge, these stations promise faster charging speeds in upcoming models. We can cite models such as Xiaomi's SU7 Ultra with a 93.7-kWh battery, a Chinese EV in competition with Porsche and Tesla, with its high voltage 800-volt architecture, supporting 5.2 C DC charging, takes just 11 minutes to complete a 10–80% charge.
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 41.2% between 2022 and 2023, from 447 845 (including 44 637 direct current [DC] chargers) to 632 254 (including 81 737 DC chargers) (table 6). The installation pace is as brisk as ever, and at the end of Q3 2024, the number of public charging points was 795 141 including 119 557 that directly deliver direct current, which makes for much faster charging times than stations delivering alternating current.
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 2023, these three Member States shared 60.8% of the European Union's public and 55.4% of the fast DC charging stations between them.
Public DC EV charging stations are expensive installations primarily meant for

RENEWABLE ENERGY IN TRANSPORT BAROMETER – **EUROBSERV'ER** – NOVEMBER 2024

Tabl. n° 6

Alternating current (AC) and Direct Current (DC) public recharging points installed in the European Union countries in 2022 and 2023

	2022			2023		
Country	AC Public recharging points[1]	DC Public recharging points[2]	Total	AC Public recharging points[1]	DC Public recharging points[2]	Total
Netherlands	111 556	2 754	114 310	140 561	3 889	144 450
Germany	70 997	12 819	83 816	97 704	22 908	120 612
France	75 097	8 220	83 317	100 767	18 488	119 255
Belgium	22 914	916	23 830	41 903	2 459	44 362
Italy	27 561	3 294	30 855	35 195	5 918	41 113
Sweden	21 891	2 466	24 357	32 413	4 753	37 166
Spain	18 347	3 743	22 090	24 930	5 442	30 372
Denmark	9 899	919	10 818	20 896	2 175	23 071
Austria	15 251	2 333	17 584	15 229	3 407	18 636
Finland	4 511	1 014	5 525	8 508	2 739	11 247
Portugal	5 223	1 310	6 533	5 582	1 723	7 305
Poland	2 597	852	3 449	4 477	1 614	6 091
Czechia	2 807	1 061	3 868	3 389	1 275	4 664
Hungary	2 868	461	3 329	2 742	575	3 317
Greece	947	38	985	2 950	216	3 166
Ireland	1 947	273	2 220	2 355	470	2 825
Romania	1 067	412	1 479	1 817	906	2 723
Slovakia	1 704	528	2 232	1 690	690	2 380
Luxembourg	2 252	106	2 358	2 143	179	2 322
Bulgaria	766	270	1 036	1 165	459	1 624
Slovenia	1 371	230	1 601	1 346	262	1 608
Lithuania	371	57	428	1 039	274	1 313
Croatia	767	326	1 093	675	399	1 074
Estonia	91	56	147	339	255	594
Latvia	327	179	506	295	239	534
Cyprus	67	0	67	306	23	329
Malta	12	0	12	101	0	101
Total EU 27	403 208	44 637	447 845	550 517	81 737	632 254

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 ≤ P ≤ 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 ≤ P <150.000W), Level 1 - Ultra-fast DC recharging point (150.000W ≤ P < 349.000W), Level 2 - Ultra-fast DC recharging point (P ≥ 349.000W). ***Source: Data gathered by the European Alternative Fuels Observatory 2024.***

charging EVs travelling on long-distance journeys. Yet, their deployment is crucial for the mass adoption of EVs. According to EAFO statistics, across the European Union, the ratio of 100% EVs on the road to fast DC chargers, was 57.7 in 2023 (74 in 2022). By way of illustration, at the end of 2023, the ratio of 100% EVs to DC chargers was 55.1 in France, 62.9 in Germany, 65.8 in Sweden and 119.8 in the Netherlands.

FIT FOR 55 : THE TRANSPORT DIMENSION COMES INTO EFFECT

Following long legislative work initiated by the " Fit for 55" package, many texts aimed at setting up instruments to reduce GHG emissions in transport were published in the OJEU during 2023. 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 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

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 CO_2 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 CO_2 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 CO_2 emission standards for newly registered heavy-duty vehicles. The current regulation provides for a 30% reduction in CO_2 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 develops 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 CO_2 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 published in the OJEU on 31 October 2023, obliges 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 a sufficient number of infrastructures for alternative fuels in the EU for road vehicles, trains, ships and parked 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. No later than 31 December 2025, the Member States must ensure that charging locations open to the public and reserved for use by heavy-duty EVs at least along 15% of the TEN-T road network, are deployed in either direction and that every charging location supplies at least 1 400 kW of power and comprises at least one charger with at least 350 kW of individual power output. Every 60 km in this same area, heavy-duty vehicles must also be able to use charging locations with a minimum of 350 kW no later than 31 December 2027. Their number will increase as years pass by.

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. 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.

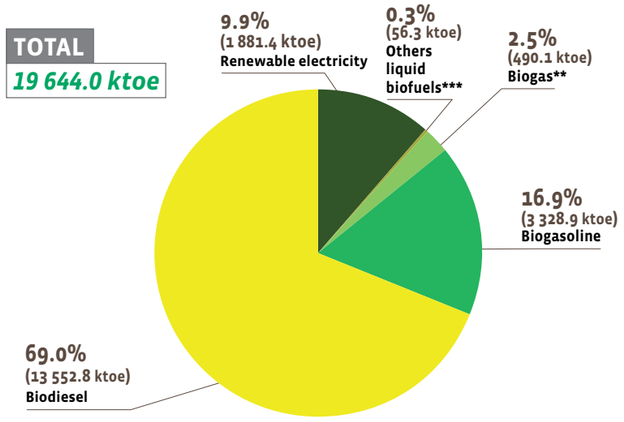
The new RED III rules furthermore establish a combined binding sub-target of 5.5% in 2030 (and an interim target of 1% in 2025) for advanced biofuels and biogas (produced from the non-food raw materials listed in Annex IX, part A) and renewable fuels of non-biological origin (mainly renewable hydrogen 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 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.

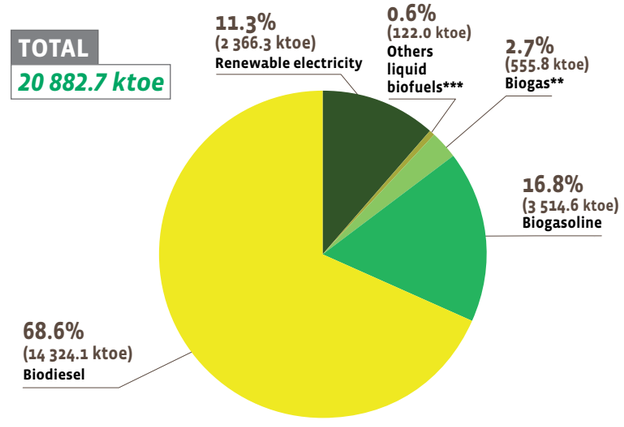
The main calculation rules have not been changed to calculate the target's numerator. Recycled carbon-based fuels can be included as well as a certain number of incentives. The share of biofuel and biogas produced from the raw materials listed in Annex IX and the share of renewable fuels of non-biological origin are considered to equate to twice their 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. □

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 2022



*Breakdown of renewable energy used in transport (all types) of the countries of the European Union to 27 (in ktoe and %) in 2023**



Estimation. ** Including biomethane blended in the natural gas grid allocated to the transport sector with appropriate traceability requirements. * Including biokerosene and vegetable oil.* ***Source: EurObserv'ER 2024.***

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), DGEG- General Directorate of Energy and Geology (Portugal), NSI (Bulgaria), Official statistical portal (Lithuania), CSB (Latvia), Statistics Estonia, Statistical office SIStat (Slovenia), EAFO, ACEA, Eurostat, EurObserv'ER

Swedish fuel distributor OKQ8 and Gasum, the Finnish gas producer have formed a partnership to open liquefied biogas filling stations in Sweden and Finland.

The next barometer will cover solid biofuels

Funded by the European Commission

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.

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