The AustroCel Hallein plant at Hallein in Austria is designed to produce 35 million litres of wood-based bioethanol per annum.

+ 4.3 %

The increase of biofuels consumption for transport in the EU27 between 2020 and 2021 (in energy content)

RENEWABLE ENERGY IN TRANSPORT BAROMETER

A study carried out by EurObserv'ER.

The gradual lifting of lockdown restrictions during 2021 naturally led to increases in energy consumption in transport and with it the corresponding renewable biofuel or electricity shares. Preliminary estimates suggest that EU-27 biofuel consumption rose by about 4.3% between 2020 and 2021 at over 17 Mtoe (million tonnes equivalent of oil). The bioethanol share of this growth (11.0%) was stronger than that of biodiesel (2.2%). Biofuel consumption was boosted by the new Renewable Energies Directive (RED II), which devised a new computing method for measuring renewable electricity consumption in transport. This new methodology establishes this consumption at 21.9 TWh in 2021, equivalent to 1.9 Mtoe.

21.9 TWh (eq 1.9 Mtoe)

Renewable electricity used in transport (road, rail, other transport modes) in the EU27 in 2021

17 Mtoe

Total biofuel consumption in EU27 transport in 2021

Renewable energy consumption in transport is now covered by a new legal framework – that of the Renewable Energies Directive 2018/2001 (known as RED II) – most of whose provisions came into force on 1 January 2021. The directive marks a new policy direction that aims to abolish high Indirect Land Use Change (ILUC) risk biofuels by the end of the decade. They will be gradually substituted by consumption of "advanced" biofuels, that are not sourced from food crops or from synthetic Renewable Fuels of Non-Biological Origin (RFNBOs), by producing "green" hydrogen with the possibility of combining it with sequestered carbon. New measures were also introduced to accelerate the electrification of transport. The main provisions of the RED II 2018 Directive's transport target are presented in the following inset.

1. BIOFUELS

THE CONTEXT OF CONSUMPTION RECOVERY

The gradual lifting of lockdown measures at the end of the 2021 winter enabled energy consumption in all modes of European Union transport – road, rail and others – to pick up. Preliminary European Union figures released by Eurostat for gross inward deliveries of transport fuels (petrol, gas/diesel, LPG and kerosene type jet-fuel) to the European Union market naturally bounced back with an increase of about 5% in 2021 over 2020. Biofuel consumption obviously benefitted from this return to normal because it is directly linked to the incorporation mandates defined in each Member State. Liquid and gaseous biofuel used in transport increased by 4.3% between 2020 and 2021, settling at 17 Mtoe in 2021 (16.3 Mtoe in 2020) **(tables 1 and 2)** according to the provisional data collected by EurObserv'ER. The rise was higher for bioethanol (11%, with consumption of almost 3 Mtoe), than for biodiesel (2.2%, 13.6 Mtoe of consumption). The use of biogas fuel in transport also grew (by 32.8%, equating to 435.5 ktoe of consumption). Incidentally, the increase in biofuel consumption was sharper in "advanced" biofuels, with consumption growing from 1.2 Mtoe in 2020 to 1.8 Mtoe 2021 (by 562.7 ktoe), or 46 % **(table 3)** according to EurObserv'ER. Furthermore, through the incentives, the transport target figure has been doubled (i.e., 3.6 Mtoe in 2021). Consumption of biofuel produced from used frying oil and animal fat waste (feedstocks listed in Part B of annex IX) is put at just below 3.3 Mtoe in 2021 (3.1 Mtoe in 2020) and this is probably because RED II has capped the consumption of these types of biofuels in transport target accounting (see inset). In 2021, this rule hit at least one Member State's (the Netherlands) transport target, as it was precluded from including all of its consumption of biodiesel produced from used cooking oil (see below).

Europe's bioethanol and HVO biodiesel figures still good in 2022

While the second half of 2021 was conducive to the recovery of biofuel consumption in transport, a few months later the biofuels market entered a new crisis, this time geopolitical. Russia's invasion of Ukraine which began on 24 February 2022, not only led to a sharp hike in fossil fuel prices on international markets, but also the price of certain agricultural raw materials, as Ukraine is a major exporter of cereals and fertilizer. Some experts, such as those of USDA (United States Department of Agriculture) in their Biofuels Annual – European Union, report of July 2022, view that this context furthered the consumption of non-cereal bioethanol produced from sugar beet and to a lesser extent cellulose bioethanol consumption. The USDA also expects the biodiesel consumption volume to be relatively stable in 2022 and based more on its HVO (hydrogenated vegetable oil) share, whose production method enables lower GHG-emitting feedstocks to be used and whose Member States' incorporation mandates are easier to fill (through double accounting). We should point out that HVO is

Tabl. n° 1

Biofuels consumption for transport in the European Union in 2020 (in ktoe)

Country	Biodiesel*	Biogasoline	Biogas**	Total	Compliant biofuels***
Germany	2 613.0	702.3	76.0	3 391.3	3 388.4
France	2 088.9	554.6	0.6	2 644.1	2 644.1
Spain	1 441.2	96.8	0.0	1 538.0	1 535.7
Sweden	1 212.4	93.2	100.5	1 406.2	1 406.2
Italy	1 245.1	19.6	82.1	1 346.8	1 345.9
Poland	856.5	183.0	0.0	1 039.5	1 039.5
Belgium	568.7	97.3	0.0	666.0	666.0
Netherlands	301.3	226.4	34.6	562.4	562.9
Romania	391.6	91.6	0.0	483.3	483.3
Austria	354.1	56.2	0.4	410.6	410.3
Finland	301.8	93.5	9.5	404.8	390.6
Czechia	306.7	65.8	1.2	373.6	373.6
Hungary	194.1	83.9	0.0	278.0	278.0
Portugal	257.3	4.8	0.0	262.1	262.1
Denmark	172.6	79.8	8.5	260.9	256.3
Greece	150.0	68.3	0.0	218.2	190.0
Ireland	155.1	19.4	0.0	174.5	174.5
Bulgaria	143.4	26.5	0.0	169.9	159.6
Slovakia	127.1	25.9	0.0	153.1	153.1
Luxembourg	126.4	14.1	0.0	140.4	140.4
Lithuania	87.2	15.8	0.0	103.0	103.0
Slovenia	84.9	8.0	0.0	93.0	93.0
Croatia	64.8	0.8	0.0	65.6	65.6
Estonia	32.8	6.2	14.5	53.5	53.4
Latvia	31.5	12.8	0.0	44.2	44.2
Cyprus	26.0	0.7	0.0	26.6	26.6
Malta	13.8	0.0	0.0	13.8	13.3
Total EU 27	13 348.2	2 647.2	328.0	16 323.4	16 259.5

** Including HVO and "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 2022**

Tabl. n° 2

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

Country	Biodiesel**	Biogasoline	Biogas***	Total	Compliant biofuels****
Germany	2 144.1	720.7	83.0	2 947.7	2 947.7
France	2 122.3	701.9	1.7	2 825.8	2 825.8
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	1 306.1	111.6	118.1	1 535.8	1 535.8
Poland	836.2	189.7	0.0	1 025.9	1 025.9
Belgium	606.8	118.7	0.0	725.5	725.5
Finland	548.1	110.3	9.5	668.0	668.0
Netherlands	364.0	233.0	41.0	638.0	638.0
Romania	391.6	91.6	0.0	483.3	483.3
Austria	410.3	49.3	0.4	460.0	459.6
Czechia	302.1	58.9	18.9	379.9	379.9
Portugal	335.4	16.6	0.0	352.0	352.0
Denmark	236.0	94.3	8.5	338.9	338.9
Hungary	192.7	82.0	0.0	274.7	274.7
Greece	154.0	68.1	0.0	222.1	222.1
Bulgaria	138.2	23.4	0.0	161.6	161.6
Ireland	128.9	17.6	0.0	146.5	146.5
Luxembourg	118.2	18.2	0.0	136.5	136.5
Slovakia	107.4	23.9	0.0	131.4	131.4
Lithuania	110.3	16.5	0.0	126.8	126.8
Slovenia	94.7	8.6	0.0	103.3	103.3
Croatia	90.9	0.2	0.0	91.1	91.1
Estonia	37.4	4.2	18.0	59.5	59.5
Latvia	35.0	11.7	0.0	46.8	46.8
Cyprus	24.5	0.7	0.0	25.2	25.2
Malta	9.7	0.0	0.0	9.7	9.7
Total EU 27	13 643.4	2939.5	435.5	17 018.5	17 017.3

** Estimation ** Including HVO and "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 2022**

considered as "advanced" only if it is manufactured with the eligible feedstocks listed in RED II annex IX, Part A.

Development of "forestry" waste biofuels

Article 29 of the RED II Directive laid down stricter environmental criteria for GHG emissions of production installations. The article specifies that the reduction in GHG emissions resulting from biofuel (and biogas) use must be at least 65% produced in installations that have entered operation since 1 January 2021, at least 70% for those starting up before 31 December 2025 and at least 80% for installations starting up from 1 January 2026 onwards. This legislation directly benefits the expansion of the lowest-emitting advanced biofuels, led by HVO biodiesel, as well as cellulose ethanol, biomethanol, biomethane (Compressed Natural Gas and Liquefied Natural Gas) and biokerosene (and other biofuels – SAF). This is particularly beneficial to new Swedish and Finnish plants, producing biofuel based on refining tall oil, a wood-to-paper pulp conversion waste product, and also bioethanol produced from food waste flows and cellulose ethanol. By way of illustration, **SunPine AB**, which is partly owned by the Swedish oil group **Preem**, commissioned a new biorefinery in 2021 on the Pitea site that increased its crude tall oil production capacity by 50%, to about 150 000 m3 (150 million litres) annually.

Additionally, PREEM and the wood product company **Setra Group** formed a JV for an initial rapid pyrolysis oil production plant, to produce a green feedstock for renewable fuels extracted from forestry residue. The plant, in the Preem biorefinery at Lysejil, with annual production capacity of 25 000 tonnes of pyrolysis oil, went on stream in September 2021.

Fintoil has made a major, 100-million euro investment to construct a 200 000-tonne capacity crude tall oil refinery at Hamina in Finland. It was commissioned in the summer of 2022 and will produce 100 million litres of "advanced" HVO biodiesel. It is now the world's largest crude tall oil plant.

UPM, which already had a 130 000-tonne wood-based biodiesel biorefinery in 2015, has also announced its intention to build a new-generation 500 000-tonne biorefinery, primarily devoted to producing sustainable aviation fuel. The technological concept, which is still on the drawing board, includes using green hydrogen in the production process.

POST-2020 RED II IN ACTION

The new Renewable Energy Directive (2018/2001) raised the target for renewable energies in transport to 14% in 2030 (compared to 10% in 2020 in the previous repealed RED directive). This threshold is classed as the "minimum share" to reach, after reformulating and adding new sustainability and greenhouse gas reduction criteria. The RED II Directive provides for the energy content of the biofuel (and biogas) share used in transport and produced from specific feedstocks to be counted as double in the energy balance of the countries using them, in order to achieve this target. This double accounting applies to the "advanced biofuels", defined in article 2, produced from the feedstocks listed in Part A of the Directive's Annex IX (algae, forestry and forest-based industry waste and residue, straw, animal manure, sewage sludge, crude glycerine, bagasse, etc.). It also includes biofuels (and biogas) produced from other feedstocks listed in Part B of the annex, primarily, used cooking oil and animal fats. Yet, biofuels produced from these feedstocks are not deemed to be advanced and so are excluded from the specific calculations for minimum shares assigned to advanced biofuels. The RED II Directive has specified targets of 0.2% for 2022, at least 1% for 2025 and at least 3.5% for 2030 for each Member State, to encourage the industrial development of "advanced biofuels". However, it enables Member States to waive these limits if they can prove that they have problems sourcing these feedstocks.

Other incentives have been set up to promote the modes of transport with the lowest greenhouse gas emissions. Thus, the renewable electricity share is counted as equal to four times its energy content when used for road transport and to 1.5 times its energy content when used in rail transport. The contribution of biofuels supplied to air and maritime transport equates to 1.2 times their energy content except for fuels produced from crops destined for human food and animal fodder. Thus, these incentives reduce the physical incorporation volumes of biofuels required to achieve the minimum share of 14% in 2030. RED II also set a cap on biofuels produced from crops traditionally used for human and animal consumption. Their share will be subject to a double constraint until 2030. Their penetration must not exceed 7% in final energy consumption in the transport sector and furthermore, may be no more than one percentage point higher than their 2020 rate. Member States wishing so can also set a lower limit and apply distinctions between biofuels. RED II also introduced a limit of 1.7% on the contribution of biofuels or biogases produced from used oils or animal fats (Part B of annex IX) (except for Cyprus and Malta). Another major aspect of the RED II directive is to be found in its article 29, which strengthens its sustainability criteria and has implications for the use of palm oil. The article sets the minimum requirements for GHG savings, protection from high carbon stock conversion and biodiversity protection. It introduces specific criteria for high Indirect Land Use Change risk biofuels (ILUC effect) and whose expanding growing area is making clear inroads into high carbon stock soils. The use of high-risk biofuels will be capped at the 2019 level until 2023 and eliminated by 2030. These criteria were spelt out by delegated act 2019/807 published in May 2019. The European Commission thereby defined the high ILUC effect risk feedstocks as those whose growing penetration into high carbon land share is over 10% with more than 1% average annual expansion in growing area since 2008. Only palm oil is affected by this provision (with soy narrowly escaping it) using the European Commission's calculations (annexed to the delegated act). Nonetheless, palm oil producers will be able to certify that their feedstock is low risk provided that they can demonstrate that their production meets general RED II sustainability criteria.

2. RENEWABLE ELECTRICITY IN TRANSPORT

A NEW COMMON RULE… A NEW START

The increased renewable electricity share coupled with the surge in EV sales, should have led to sharp rises in EU renewable electricity consumption for transport. However, a new statistical feature inherent to RED II caused a break in some countries' statistical series between 2020 and 2021. As it happens, the accounting rules for this indicator defined by the 2009/28/EC Directive applied until 2020, and since 2021 have been replaced by the new (EU) 2018/2001 Directive rules. The upshot is that the renewable electricity consumption figure calculated for the transport sector must be based on

Tabl. n° 3

Biofuel consumption whose raw materials used are considered to be equivalent to twice their energy content in 2020, illustrative data for 2021 (in ktoe)*

	2020			2021		
Country	Advanced biofuel [1]	Used cooking oil and animal fats [2]	Total 2020	Advanced biofuel [1]	Used cooking oil and animal fats [2]	Total 2021
Italy	407.6	536.5	944.0	538.3	800.1	1 338.4
Spain	66.9	484.7	551.6	471.3	396.0	867.3
Germany+	113.6	591.7	705.3	113.6	591.7	705.3
Netherlands	98.1	301.3	399.4	100.0	410.2	510.2
Sweden+	240.5	58.0	298.4	240.5	58.0	298.4
France	46.1	186.5	232.6	60.8	124.9	185.7
Ireland+	10.9	154.1	165.0	10.9	154.1	165.0
Portugal+	7.0	153.1	160.1	7.0	153.1	160.1
Hungary+	0.1	144.0	144.1	0.1	144.0	144.1
Czechia+	6.5	81.2	87.7	6.5	81.2	87.7
Finland+	87.1	0.0	87.1	87.1	0.0	87.1
Belgium	16.7	38.8	55.5	27.6	39.8	67.4
Slovenia+	16.2	49.1	65.3	16.2	49.1	65.3
Bulgaria+	16.6	39.2	55.8	16.6	39.2	55.8
Luxembourg	0.0	60.3	60.3	0.0	55.4	55.4
Greece+	0.0	41.2	41.2	0.0	41.2	41.2
Denmark+	12.6	25.7	38.4	12.6	25.7	38.4
Estonia+	22.5	14.5	37.0	22.5	14.5	37.0
Slovakia+	0.0	36.2	36.2	0.0	36.2	36.2
Croatia+	0.0	35.2	35.2	0.0	35.2	35.2
Poland+	34.8	0.0	34.8	34.8	0.0	34.8
Cyprus+	0.0	18.5	18.5	0.0	18.5	18.5
Austria+	9.8	3.3	13.0	9.8	3.3	13.0
Latvia+	9.9	0.2	10.1	9.9	0.2	10.1
Malta+	0.1	7.5	7.6	0.1	7.5	7.6
Lithuania	0.0	0.2	0.2	0.0	0.0	0.0
Romania+	0.0	0.0	0.0	0.0	0.0	0.0
Total EU 27	1 223.7	3 060.8	4 284.4	1 786.4	3 278.9	5 065.3

** 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 2021 during our survey, by default EurObserv'ER used for the year 2021 the same consumption data as for 2020. The data for 2021 for the consumption of these types of biofuels therefore remain indicative.*

The AustroCel Hallein plant at Hallein in Austria.

the national electricity production mix. Previously Member States could choose between their domestic mix and the average EU mix. So, countries that previously used the average EU renewable electricity production mix as their reference figure, which was higher than their own, must now recalculate this indicator. We should recall that the reference figure dates back to the two-year period prior to the year the electricity is supplied on their territory (normalised electricity production for wind energy and hydropower).

This rule also applied under the previous directive.

The input of renewable electricity consumption has declined through this computing change rather than increasing in some countries' transport sectors. This phenomenon applies to France, the Netherlands and Eastern European countries such as Poland and the Czech Republic. We will have to wait for 2022 data, namely two indicators constructed in the same way, to hone our accuracy on the increase in renewable electricity consumption in these countries' transport sectors. The preliminary data gathered or estimated by EurObserv'ER in **table 4** for 2021, puts this consumption at 1 881.6 ktoe (including 228.1 ktoe used in road transport). Now in some countries, a large proportion of renewable electricity consumption in transport is not clearly monitored and is assigned, by default, to the "other transport modes" category. Despite some countries' poor data, 2021 posts a year-on-year increase of about 4.5% of EU-wide renewable electricity consumption across all forms of transport. Most of this rise can be attributed to renewable electricity consumption in road transport, through burgeoning rechargeable EV sales.

MORE THAN 1.7 MILLION EVS REGISTERED IN 2021 ACROSS THE EU

Changing from one technology to another often occurs faster than one might think. The trend to migrate to rechargeable EVs is gaining strength. The European Automobile Manufacturers' Association (ACEA) data presented in **table 5**, reports that between 2020 and 2021 there was a 63.1% increase in new EU registrations of Battery Electric Vehicle (BEVs) from 538 734 to 878 432, and a 63.1% increase in hybrid petrol or diesel rechargeable passenger vehicle

Tabl. n° 4

Renewable electricity used in transport (road, rail, other transport modes) in 2020 and 2021 (in ktoe)*

	2020				2021			
Country	Ren. electricity in road transport	Ren. electricity in rail transport	Ren. electricity in other transport modes	Total	Ren. electricity in road transport	Ren. electricity in rail transport	Ren. electricity in other transport modes	Total
Germany	21.5	351.3	0.0	372.8	48.9	405.4	0.0	454.3
Italy	5.6	135.5	154.1	295.1	13.5	146.6	166.7	326.8
Sweden	28.2	128.8	0.0	157.0	87.8	156.8	0.0	244.5
Austria	0.9	117.5	78.9	197.3	1.4	124.9	83.9	210.1
France	11.7	192.0	27.1	230.9	9.2	153.1	21.2	183.5
Spain	6.1	88.5	6.4	101.0	11.3	99.4	7.2	117.9
Romania	1.5	36.0	1.5	39.0	3.2	38.6	1.6	43.4
Poland	2.1	80.1	5.7	87.9	2.2	35.4	2.5	40.2
Denmark	5.1	22.7	0.0	27.9	12.4	25.0	0.0	37.4
Netherlands	18.6	41.3	0.0	60.0	10.6	25.5	0.0	36.0
Belgium	3.7	40.5	0.5	44.7	4.6	27.5	0.7	32.8
Finland	4.0	21.7	0.0	25.6	7.8	23.7	0.0	31.4
Portugal	0.5	18.6	0.3	19.3	0.8	20.8	0.2	21.8
Czechia	2.0	41.7	1.8	45.5	1.5	18.1	0.8	20.4
Luxembourg	0.5	3.6	0.0	4.1	1.9	12.4	0.0	14.3
Croatia	0.1	9.3	1.5	10.8	0.3	10.1	1.6	12.0
Hungary	1.7	31.6	0.3	33.6	1.1	9.7	0.1	10.9
Slovakia	0.7	11.6	1.7	14.0	0.9	7.9	1.2	9.9
Bulgaria	1.0	10.2	0.3	11.5	1.0	7.4	0.2	8.6
Greece	0.6	5.0	0.0	5.6	2.0	4.9	0.0	6.8
Slovenia	0.1	5.6	0.2	5.8	0.1	5.6	0.2	5.9
Latvia	1.3	2.9	0.2	4.3	1.9	3.0	0.2	5.1
Ireland	1.2	1.4	0.0	2.5	2.2	1.6	0.0	3.8
Lithuania	1.1	0.4	0.5	2.0	1.4	0.4	0.6	2.4
Estonia	0.4	0.3	1.2	1.9	0.4	0.2	0.8	1.4
Malta	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total EU 27	119.9	1398.2	282.1	1800.3	228.1	1363.7	289.7	1881.6

** 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 2022***

Second-generation fast biomass pyrolysis plant (Fast Pyrolysis Bio-Oil or FPBO) produces biofuel at Gävle, Sweden

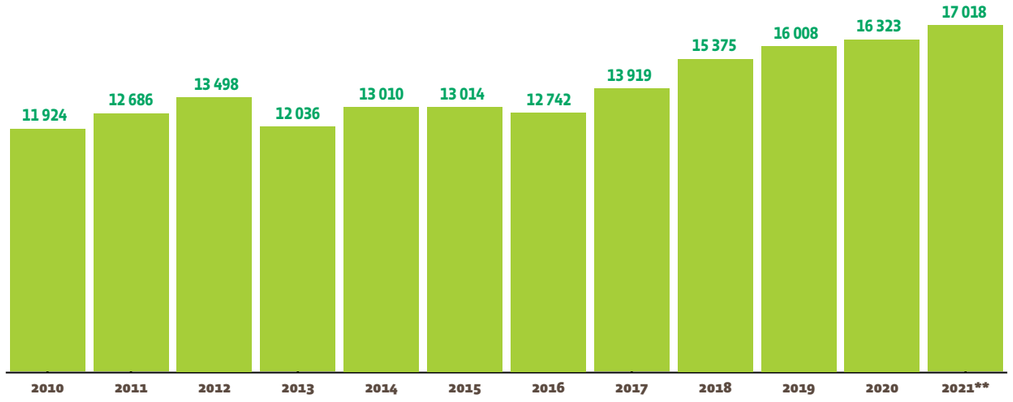
registrations (of the Plug-in Hybrid Electric Vehicle [PHEV] type), from 507 917 to 867 092. Thus over 1.7 million rechargeable passenger vehicles (1 745 524 units) went on the road in 2021 compared to 1 046 651 in 2020. The rechargeable EV market share of total passenger vehicle sales rose to 18% in 2021 (9.1% for 100% electric and 8.9% for rechargeable hybrids) compared to only 10.5% in 2020 (5.4% for 100% electric and 5.1% for rechargeable hybrids) and 3% in 2019 (1.9% for 100% electric and 1.1% for rechargeable hybrids).

The non-rechargeable passenger vehicle share, namely of vehicles with a small battery that is automatically charged during the braking and deceleration phases using the vehicle's inertia, remains a little higher with a 19.6% share in 2021 (11.9% in 2020 and 5.7% in 2019). Although this class of vehicles performs better than combustion engine vehicles, they are excluded from the renewable electricity consumption figures in transport. Their renewable electricity consumption depends entirely on the biofuel share of the petrol or diesel that they run on. At 59.6%, conventional diesel- or petrol-driven combustion engine vehicles, dominate European Union vehicle sales, but their sales volume collapsed in 2021 (by 31.5% year on year for diesel passenger vehicles, or 1.9 million vehicles and by 17.8% year on year for petrol passenger vehicles, or 3.9 million vehicles).

The European Alternative Fuels Observatory (EAFO) data for the total fleet of rechargeable passenger EVs (M1) and light utility EVs (N1) on the road, records over 4 million units at the end of 2021 (2.2 million BEVs and 1.9 million PHEVs) and 5.3 million as early as the end of the first half of 2022 (2.9 million BEVs and 2.4 millions PHEVs). Taking the EU's 250 million combustion engine passenger vehicles off the road will be a lengthy process, but transition to the electrification of road transport has clearly begun.

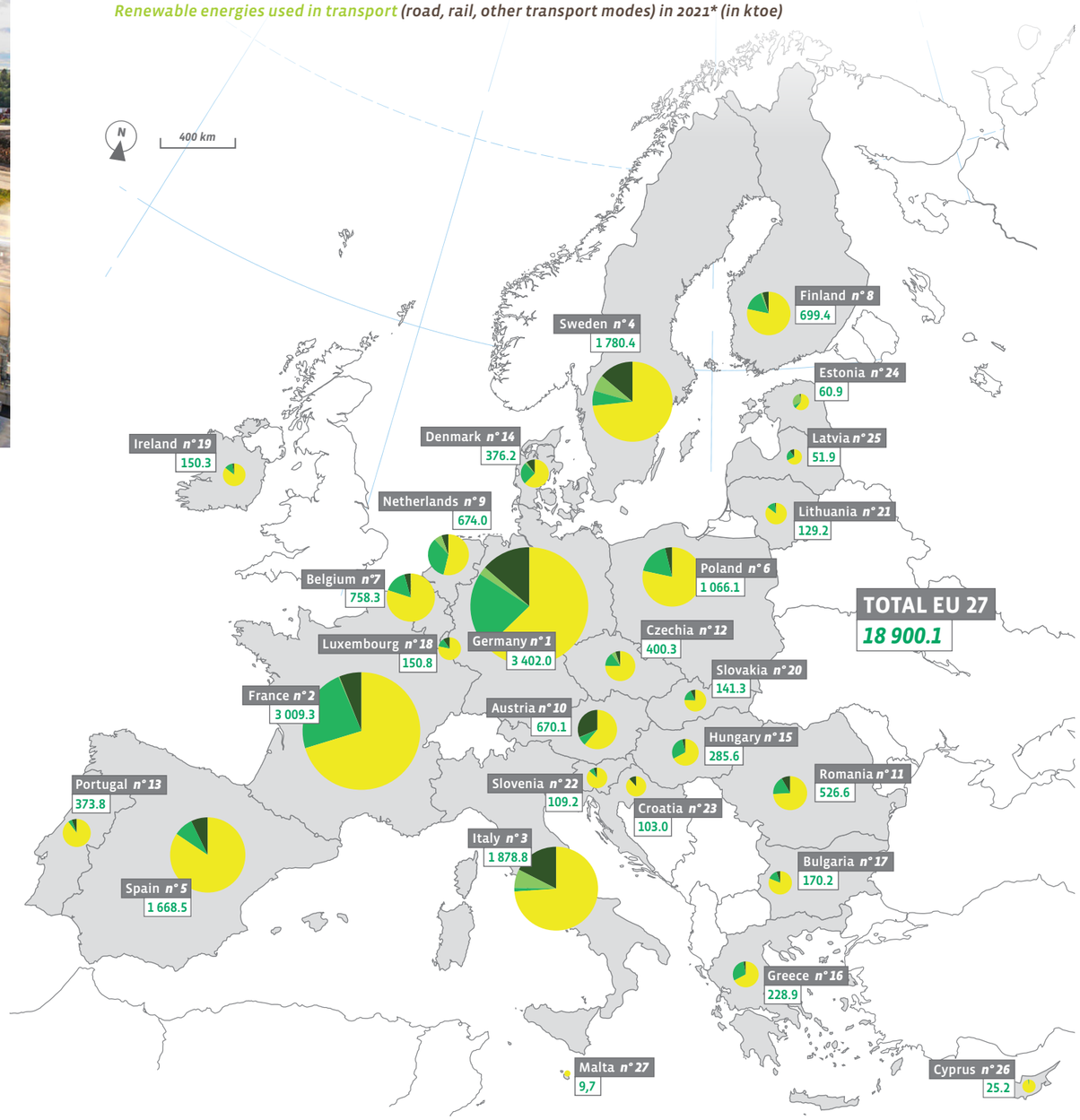
Graph. n° 1

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



** Compliant biofuel and not compliant. ** Estimation.* ***Source: Data from 2010 to 2019 (Shares Eurostat 2022); 2020-2021 (EurObserv'ER 2022)***

Renewable energies used in transport ***(road, rail, other transport modes) in 2021* (in ktoe)***



Key

Country
3 402.0

Renewable energies used in transport (road, rail, other transport modes) in 2021 (in ktoe)*

Biodiesel *Biogasoline* *Biogas* *Renewable electricity*

** Estimation*
*** Including HVO*
**** Including biomethane blended in the natural gas grid allocated to the transport sector with appropriate traceability requirements.*
Source: EurObserv'ER 2022.

ELECTRIFICATION OF ROAD TRANSPORT IN PACE WITH CHARGING

Most privately-owned EVs are charged at home, plugged into secure sockets or domestic charging stations. When feasible, this solution is the cheapest and most convenient charging method, as vehicle owners can charge their EVs at night or during the weekend, thereby taking up off-peak electricity rates. The solution is even cheaper for solar photovoltaic panel owners who produce and use their own electricity, as it costs less to operate solar panels than charge their EVs at a grid socket. It increasingly makes sense to purchase an EV and invest in a 3- or 6-kW self-consumption solar panel installation. A public charging network on motorways, filling stations, near hotels and at public local authority facilities is essential to supplement home charging for charging EVs on long journeys. The rollout of a vast, countrywide public charging network is vital for medium- and long-distance travel and the democratisation and generalisation of electric vehicles.

According to EAFO data, local authorities have taken the initiative to densify the network of public charging stations in the European Union. Their number increased by about 39% in the year to December 2021 (from 234 377 to 325 888) **(table 6)**. This fast installation pace continued through 2022, and by the end of June the number of public charging stations was set to cross the 400 000 threshold (393 914 units to be precise).

Just over 10% of these charging stations directly deliver DC, which offer much faster charging times than stations delivering AC (see inset). However, this rapid Europe-wide progress conceals disparities as some countries have very patchy networks in stark contrast to the swift rollouts of Germany, France and the Netherlands. In 2021, these three Member States accommodated almost 62.3% of the EU's public charging stations between them and 50.5% of the fast DC charging stations. Other EU countries with full-blown public charging station installation programmes between 2020 and 2021 are Italy (26 801 stations, a 75.3% rise), Sweden (20 036 stations, a 31.8% rise), Austria (17 223 stations, a 66.4% rise) and Belgium (13 938 stations, a 67.9% rise).

Tabl. n° 5

New passenger electric car registrations (battery electric vehicles and plug-in hybrid electric vehicle) in 2020 and 2021.

	BATTERY ELECTRIC VEHICLES (BEV)1		PLUG-IN HYBRID ELECTRIC VEHICLES (PHEV)		Total 2021 (BEV +PHEV)
Country	2020	2021	2020	2021	
Germany	194 471	356 425	200 469	325 449	681 874
France	111 127	162 167	74 592	141 001	303 168
Italy	32 502	67 283	27 407	70 472	137 755
Sweden	27 973	57 489	66 105	77 842	135 331
Netherlands	73 005	64 149	14 891	31 016	95 165
Belgium	14 994	22 677	31 694	47 761	70 438
Spain	17 927	23 690	23 309	43 226	66 916
Denmark	14 275	25 000	18 243	40 478	65 478
Austria	15 986	33 380	7 641	14 626	48 006
Finland	4 244	10 152	13 231	20 139	30 291
Portugal	7 830	13 260	11 867	15 660	28 920
Ireland	4 013	8 646	2 492	7 891	16 537
Poland	3 679	7 164	4 505	9 269	16 433
Luxembourg	2 473	4 650	2 685	4 443	9 093
Romania	2 845	6 342	1 036	2 630	8 972
Hungary	3 046	4 312	2 996	4 236	8 548
Greece	679	2 176	1 456	4 785	6 961
Czechia	3 284	2 701	1 981	3 907	6 608
Slovakia	918	1 105	863	1 166	2 271
Slovenia	1 647	1 722	39	191	1 913
Croatia	533	1 475	143	399	1 874
Lithuania	453	1 155	0	0	1 155
Estonia	342	484	75	167	651
Latvia	307	425	73	144	569
Bulgaria	139	321	41	97	418
Cyprus	42	82	83	97	179
Total EU 27	538 734	878 432	507 917	867 092	1 745 524

1. *Includes fuel cell electric vehicles (FCEV type).* 2. *Only countries for which sourced data is available are listed.*
Source: ACEA (European Automobile Manufacturers Association).

These new Scania electric trucks take up to 624 kWh of installed battery to extend their delivery range over an entire region

3. NEWS FROM AROUND THE COUNTRIES

NEW START FOR THE NETHERLANDS

The new calculation and incentive rules for assessing the renewable energy consumption eligible for inclusion in the transport target calculation have had a strong impact on some countries. A point in case is the Netherlands, which is a major consumer of HVO biodiesel produced from used cooking oil, while the renewable electricity share of its grid mix is much lower than the EU average.

Statistics Netherlands has released provisional data showing that the country's biofuel consumption grew by 13.4% between 2020 and 2021 to 638 ktoe. Biodiesel consumption was the main beneficiary (rising by 20.8%, i.e., 364 ktoe used in 2021) followed by bioethanol (which rose by 2.9%, i.e., 233 ktoe used in 2021). Biogas fuel consumption also grew considerably, by 41 ktoe for 2021 (18.3% more than in 2020).

Significant progress was also made by biofuels sourced from the feedstocks listed in Annex IX of the 2018 RED II Directive. Their consumption increased by 110.8 to 510.2 ktoe (a 27.7% year-on-year rise). The Netherlands is an outlier as 80% of its consumption in 2021 (71% in 2020) was based on advanced biofuels produced from used frying oil or animal fats. As it stands, the Netherlands is the European Union's leading HVO biodiesel producer whose production is partially based on these feedstocks. The skew is caused by the restrictive policy on the use of food crop-sourced biofuels. The energy content incorporation volume of the latter was limited to 5% in 2021 and will be reduced to 1.2% in 2022 to 2025. The energy content incorporation volume of advanced biofuels which increased to 1.2% in 2021, will gradually rise to 1.7% in 2022, 2.3% in 2023, 2.9% in 2024 and 3.5% in 2025. The 2021 biofuel incorporation volume of 17.5% in 2021, will drop to 16.4% in 2022, then gradually rise to 19.8% in 2025. Despite the sharp increase in the consumption of biofuels not sourced from food crops, the 1.7% ceiling for biofuels derived from used cooking oils (Annex IX, Part B) stipulated in the RED^II directive has dealt a blow to the consumption figure of biofuel eligible for inclusion in the transport target. The new calculation method for the amount of renewable electricity used in transport, which must now be computed from the individual country's electricity mix and no longer from the EU average has put further downward pressure on the figure. Even making allowance for the incentives, the amount of eligible renewable energy has dropped from 1158.8 to 824.7 ktoe (provisional figure), although total energy consumption in transport has increased by about

FAST AND VERY FAST CHARGING STATIONS

There are two types of charging stations for EVs, those delivering alternating current (AC) and those delivering direct current (DC). Two points need to be borne in mind to distinguish them. The first is that energy is always stored in a battery as direct current, the second is that the electricity grid always delivers power as alternating current. With an AC charging station, which is the most widespread charging mode, the onboard charger of the EV converts alternating current that arrives from the terminal. Depending on the available current capacity, alternating current can offer charging capacities of up to 43 kW. However, the capacity of the EV's onboard converter often limits the vehicle's potential charging speed. When charging with a DC charging station, the electricity grid's alternating current is converted by transformers integrated into the charging station (not by the vehicle). Once converted, the direct current circulates directly from the station to the vehicle's battery. DC charging stations' integrated converter capacities may be very high... some offer 349 kW of output power and even more with the new Level 2 generation of ultra-fast chargers that can fully recharge an EV in just minutes for vehicles that can accept this charging power. Public DC charging stations are expensive installations whose ratings must suit the grid. They are primarily intended for charging EVs travelling long distances, so they tend to be found at motorway filling stations and some shopping centres.

Tabl. n° 6

Alternating current (AC) and Direct Current (DC) public recharging points installed in the European Union countries in 2020 and 2021

	2020			2021		
Country	AC Public recharging points	DC Public recharging points	Total	AC Public recharging points	DC Public recharging points	Total
Netherlands	63 993	2 024	66 017	83 437	2 388	85 825
Germany	37 474	6 971	44 445	53 261	9 270	62 531
France	42 000	3 751	45 751	51 022	3 631	54 653
Italy	13 436	1 852	15 288	24 487	2 314	26 801
Sweden	13 528	1 678	15 206	17 911	2 125	20 036
Austria	8 381	1 968	10 349	15 462	1 761	17 223
Belgium	7 668	633	8 301	13 228	710	13 938
Spain	7 023	1 803	8 826	9 964	2 032	11 996
Denmark	3 048	458	3 506	5 526	514	6 040
Finland	3 540	433	3 973	4 582	709	5 291
Portugal	2 048	642	2 690	3 310	607	3 917
Hungary	1 052	249	1 301	2 322	563	2 885
Poland	1 170	590	1 760	2 124	657	2 781
Czechia	654	477	1 131	1 570	729	2 299
Slovakia	238	231	469	1 279	347	1 626
Slovenia	649	120	769	1 219	192	1 411
Romania	324	160	484	820	417	1 237
Ireland	868	286	1 154	863	222	1 085
Luxembourg	1 055	24	1 079	1 036	10	1 046
Croatia	359	141	500	629	311	940
Bulgaria	124	71	195	459	220	679
Greece	280	6	286	607	22	629
Latvia	145	239	384	204	276	480
Estonia	33	159	192	50	148	198
Lithuania	70	103	173	74	107	181
Malta	99	1	100	98	0	98
Cyprus	48	0	48	62	0	62
Total EU 27	209 307	25 070	234 377	295 606	30 282	325 888

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). 1. 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 ≥ 349.000). ***Source: Data gathered by the European Alternative Fuels Observatory (https://www.eafo.eu), excepted France data for the year 2020 and Slovenia data for 2021.***

3.8% to roughly 9.5 Mtoe. At the end of the day, the new directive's new calculation method scaled down the renewable energy share used in transport to 8.7% in 2021 compared to 12.6% in 2020 using the old method.

FRANCE SLIPS A POINT

The RED II Directive's accounting rules will also lower French efforts to achieve the transport target, albeit to a lesser extent. France posted a roughly 1 percentage point drop resulting in a share of about 8%. The Ministry of Energy Transition reports that biofuel consumption increased by 6.9% between 2020 and 2021, from 2 644.1 to 2 825.8 ktoe. Most of this increase can be credited to bioethanol whose consumption increased by 26.5% to 701.9 ktoe followed by biodiesel which increased by 1.6% to 2 122.3 ktoe (included 2.3 ktoe "other liquid biofuels"). Consumption of the biofuels sourced from cooking oils and animal fats included in the total slumped by 33% falling from 186.5 to 124.9 ktoe while the consumption of advanced biofuels increased from 46.1 to 60.8 ktoe. Higher bioethanol consumption can be attributed to the increase in its energy content incorporation volume from 8.2% in 2020 to 8.6% in 2021, while the biodiesel incorporation volume was stable at 8% between 2020 and 2021. Other specific French provisions are that since 2019, the energy content volume of biofuels produced from used cooking oils and animal fats has been limited to 0.9%, those produced from tall oil and tall-oil pitch (tarry texture) to 0.6%, and sugar and starch plant residues to 0.4% since 2020. On 24 February 2021, the French Council of State also prohibited the inclusion of palm oil in biofuels. This ban came into force on 1 January 2020. The French renewable electricity share of its mix is lower than that of the European Union, which also reduces the renewable electricity consumption indicator in transports. Hence the renewable electricity consumption in transport indicator fell between 2020 and 2021, despite the increases in rechargeable EV sales and rail traffic.

The Tesla CCS Combo fast charging socket

SPAIN FAVOURS ADVANCED BIOFUELS

According to the Spanish Ministry for Ecological Transition, its domestic biofuel consumption stalled, increasing by only 0.8% between 2020 and 2021, from 1 538 to 1 550.6 ktoe. Biodiesel consumption actually contracted from 1 441.2 to 1 410.1 ktoe (by 2.2%), and this can only be explained by the rise in bioethanol consumption in transport, from 96.8 to 140.6 ktoe (45.3%). Yet, Spain clearly changed the composition of biofuels incorporated into petrol and diesel in 2021 by a year-on-year seven-fold increase in advanced biofuel incorporation in its consumption level, from 66.9 ktoe to 471.3 ktoe in 2021. This contrasts with its consumption of biofuels produced from used cooking oil which dropped from 484.7 to 396 ktoe. The reason for this situation may be that Spain is a major European HVO biodiesel manufacturer through its Repsol and Cepsa oil companies. Renewable electricity consumption in transports has increased in all modes of transport (road, rail and other), by a total of 16.6% to reach 117.9 ktoe. It is one of the countries whose renewable share of electricity production is higher than the EU average and so has not been penalised by the RED II accounting rules. Nonetheless, its Ministry for Ecological Transition expects the renewable energy share of its transport target to slip from 9.5 to 9.2%, despite factoring in the incentives. This can be ascribed to lower growth in the renewable energy contribution to transports (11.6%, i.e., 2 618.5 ktoe in 2021) than that of the total energy used in transports (15.7% growth, or 28 479.7 ktoe in 2021).

4. AN INITIAL STRONG DECISION ADOPTED UNDER THE FRAMEWORK OF THE GREEN DEAL

Current legislation is set to change rapidly under the terms of the current RED II revision. Discussions have already resulted in strong transport electrification measures (see below). Essentially, the European Commission published its "Fit for 55" legislative package in July 2021, that plans to raise the Renewable Energy Directive's 2030 targets to achieve the climate

neutrality goal by 2050 defined in the European Green Deal and reduce net GHG emissions by 55% compared to 1990 levels by 2030. It sets a new global renewable energy target of 40% and a new binding target of 13% to reduce GHG intensity in transports compared to the reference fossil fuel emissions level, to replace the 14% renewable energy consumption target in transport. Thus, a GHG emission reduction targets system for fuels is already implemented in Germany, as a decarbonizing tool in transports, with the additional aim of favouring the use of biofuels that emit less CO_2. The German GHG reduction target rose from 6 to 7% between 2021 and 2022 and should gradually rise to 25% in 2030.

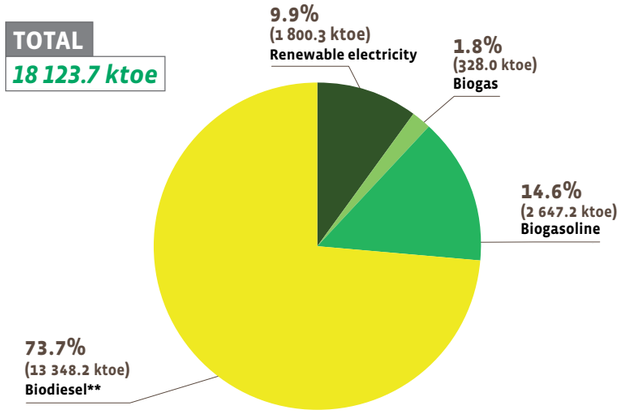
However, there is no change in the proposed overhaul of the 2018 RED II Directive for the "agrofuel" ceiling which is 1% above the consumption levels of each Member State in 2020, to a global ceiling of seven percent of their final road and rail transport consumption. In contrast, the European Commission plans to set a new 2.2% target for the use of advanced biofuels by 2030, and also to abolish the multipliers (on advanced biofuels, used oils, etc.). At the end of the day, the new sub-target will be more ambitious than the current RED II target of 3.5%. It also intends to set a 2.6% sub-target for Renewable Fuels of Non-Biological Origin (RFNBOs), which demonstrates the Commission's interest in promoting these fuels produced from renewable hydrogen. These proposals were discussed at the European Council meeting of 27 June 2022 which approved higher targets than those of the RED II Directive. As for the sub-targets for transports, the Council paved the way for Member States to choose between a binding 13% reduction target in GHG intensity in transports by 2030 or a binding renewable energy target of at least 29% in final energy consumption in the transport sector by the same deadline. The Council set a binding sub-target for advanced biofuels in the renewable energy share supplied to the transport sector of 0.2% in 2022, 1% in 2025 and 4.4% in 2030, while integrating the addition of double accounting for these fuels. Thus, this formulation is similar to the indicative sub-target of 2.2% in 2030 without the multipliers as proposed by the European Commission. The Council agreed on an indicative sub-target of 2.6% for renewable fuels of non-biological origin in transports (primarily renewable hydrogen and hydrogen-based synthetic fuels), which matches the European Commission's proposed sub-target, and effectively amounts to a 5.2% share when double accounting is applied.

A strong commitment has already been made through these negotiations on the new legislative package. The European Council and European Parliament came to an initial pact on 27 October 2022, by finally decreeing the end of diesel- and petrol-driven combustion engine vehicle sales in the EU in 2035. The text approved by the Member States, based on the Commission's "Fit for 55" proposal, plans to **reduce the CO_2 emissions of new cars in Europe to zero from 2035 onwards.** This historic decision, equates to curtailing sales of new petrol-and diesel-driven private cars (M1), light utility vehicles (N1) as well as hybrid vehicles in the EU on that date, in favour of 100% electric vehicles. The agreement also plans for CO_2 emissions from new private cars in the European Union to drop by 55% by 2030 from their 2021 level, while utility vehicles will have to reduce these emissions by 50%. This decision clearly sets out the strategic trajectory for transport… namely the programmed abolition of combustion engines in favour of the generalised 100% decarbonised renewable or nuclear electrification of transports.

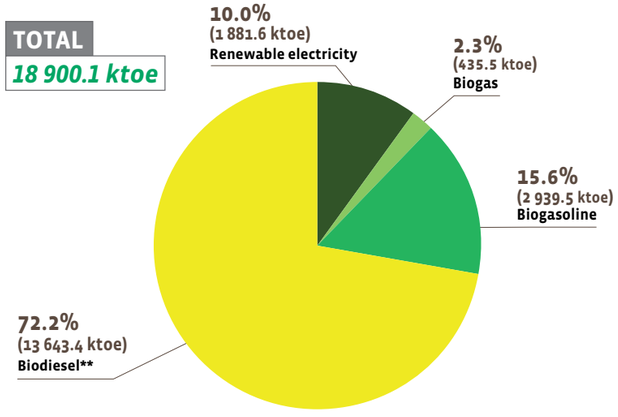
Europe's MEPs have agreed to set minimum national compulsory targets for the rollout of alternative fuel infrastructures to attain them. The Member States must present their plans on how to succeed in this by 2024. The adopted text stipulates that there must be at least one EV charging station every 60 km along the European Union's main roads by 2026. Note, that under pressure from some countries, and Germany in particular, an option remains open for the future of hybrid rechargeable motorisations or those that use synthetic fuels produced from renewable or decarbonised electricity. A revision clause agreement effectively pledges that in 2026, the Commission will conduct an in-depth assessment of the progress made towards achieving the 100% emissions reduction target and the need to review the target in the light of the technological changes in place. The European Council and Parliament have yet to formally adopt this agreement. □

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 2020



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



** Estimation. ** Including HVO and "other liquid biofuels". **Source: EurObserv'ER 2022.***

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

The next barometer will cover solid biofuels

Funded by the European Commission

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