



Some countries view biogas fuel as a strategic priority for achieving the renewable target share in transport by the 2030 timeline. This particularly applies to Sweden and Italy whose legislation encourages its use in transport.



ESSO



+ 6.8 %

The increase of biofuels consumption for transport in the EU28 between 2018 and 2019 (in energy content)

BIOFUELS BAROMETER

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

Last year, biofuel consumption used in transport in the European Union of 28 increased by just over 1.1 million tonnes oil equivalent (Mtoe). According to EurObserv'ER, it should stabilize at 17.8 Mtoe in 2019, as against 16.7 Mtoe in 2018, which is a 6.8% increase. This growth is directly linked to the increase in certain member countries' incorporation mandates, through policies implemented to achieve the binding 10% target of renewable energies in the transport sector by the end of 2020.

80.5 %

Biodiesel part in the total biofuel consumption in EU28 transport in 2019 (in energy content)

17.8 Mtoe

Total biofuel consumption in EU28 transport in 2019

The European biofuel development legislative framework is now clearly defined over the long term. This has given the Member States and industry players new visibility to meet the European Union's targets. An initial step was taken in 2015 by the publication of Directive 2015/1513/EU known as ILUC to improve the integration of Indirect Land Use Change effects that impair GHG savings. The ILUC directive set a 10% renewable energy target in transport by the end of 2020 with a 7% cap for biofuels that compete with food use and an indicative target of 0.5% for advanced biofuels. It also defined a first list of feedstocks used to produce advanced biofuels.

The adoption of the new renewable energies directive (2018/2001/EU) known as "RED II" that sets the roadmap through to 2030 has given the sector even more visibility. By reformulating and adding new sustainability and GHG reduction criteria and setting specific targets to biofuels originating from waste (oils or fats) or feedstocks not originating from food crops it pushes the renewable energies target in transport to 14% in 2030 (a threshold that is qualified as the "minimal share" to reach). The RED II directive provides for the share of biofuels and biogas used for transport and produced from certain feedstocks to be considered at double their energy content in the energy balance of the countries that will use them in order to achieve the assigned target of 14%. This double accounting is applied to both "advanced biofuels" (and biogas), that it defines in its article 2, that are produced from the feedstocks listed in Part A annex IX of the directive (waste and forestry residues and come from the timber sector, wastewater treatment sludge, straw, manure, raw glycerine, bagasse, algae, etc.). It also applies to biofuels (and biogas) produced with other feedstocks listed in Part B of that annex, namely used cooking oils and animal fats. However, the biofuels produced from these materials are not recognized as advanced and so are not included in the specific targets of minimum shares allotted to advanced biofuels. To enable the industrial development of "advanced biofuels", RED II provides for a specific target of 0.2% in 2022 for each Member State followed by at least 1% in 2025 and

Sustainability criteria

RED II defines a series of sustainability and GHG emission criteria that bioliquids used in transport must comply with to be counted towards the overall 14% target and to be eligible for financial support by public authorities. Some of these criteria are the same as in the original Renewable Energy Directive, while others are new or reformulated. For liquid biofuels, the default GHG emission values and calculation rules are provided in Annex V. The greenhouse gas savings thresholds for biofuels in transport are 50% for plants with an operation start date before October 2015, 60% after October 2015 and will be 65% from January 2021. The European Union points out that while biofuels are important in helping the EU meet its greenhouse gas reduction targets, biofuel production typically takes place on cropland that was previously used for other agriculture such as growing food or feed. Since this agricultural production is still necessary, it may lead to the extension of agriculture land into non-cropland, possibly including areas with high carbon stock such as forests, wetlands and peatlands. This process is known as indirect land use change (ILUC). As this may cause the release of CO₂ stored in trees and soil, indirect land use change risks negating the greenhouse gas savings that result from increased biofuels. To address the issue of the ILUC effect, the revised Renewable Energy Directive (RED II) introduced a new approach. It sets limits on high ILUC-risk biofuels, bioliquids and biomass fuels with a significant expansion in land with high carbon stock. These limits will affect the amount of these fuels that Member States can count towards their national targets when calculating the overall national share of renewables and the share of renewables in transport. Member states will still be able to use (and import) fuels covered by these limits, but they will not be able to include these volumes when calculating the extent to which they have fulfilled their renewable targets. These limits consist of a freeze at 2019 levels for the period 2021-2023, which will gradually decrease from the end of 2023 to zero by 2030. The Directive also introduces an exemption from these limits for biofuels, bioliquids and biomass fuels certified as low ILUC-risk. As required by the directive, the Commission has adopted the Delegated Regulation (EU) 2019/807 of March 13, 2019 following a two-month period of scrutiny by the European Parliament and the Council. This delegated act sets out specific criteria for determining high ILUC-risk feedstock for which a significant expansion of the production area into land with high carbon stock is observed and for certifying low ILUC-risk biofuels, bioliquids and biomass fuels.

(source: <https://ec.europa.eu/jrc/en/jec/renewable-energy-recast-2030-red-ii>)

at least 3.5% in 2030. Yet, the Directive enables the states to waive these limits if they can prove problems relating to the availability of the relevant feedstocks. Other premiums have also been set up to encourage more virtuous transport modes with GHG emissions in mind. The renewable electricity share is considered as being equivalent to four times its energy content when it is intended for road transport and it can be considered as being equivalent to 1.5 times its energy content when intended for rail transport. The contribution of fuels supplied to air and maritime transports

equal to 1.2 times their energy content with the exception of fuels produced from crops intended for human and animal nutrition. The effect of these premiums is to reduce the volumes of physical incorporation of biofuels needed to achieve the minimal 14% share in 2030. The RED II directive has also set a cap for biofuels produced from crops traditionally intended for human and animal nutrition (defined as "agro-fuels"). Their share in 2030 will be subject to a dual constraint: they must not exceed a maximum share of 7% in final energy consumption in the transport sector and

also their level cannot be higher than one percentage point more than the rate that will be theirs in 2020. Moreover, it is possible, for those Member States that wish, to set a lower limit and operate distinctions between biofuels. The RED II directive has also instigated a limit for the contribution of biofuels or biogas produced from used oils or animal fats (Part B of annex IX) set at a ceiling of 1.7% by 2030.

17.8 MTOE OF BIOFUEL USED IN 2019 IN THE EU OF 28

Biofuel consumption in the EU of 28 in 2019 reached the 17.8 Mtoe threshold, i.e. 1.1 Mtoe more than in 2018. If we consider the energy content, rather than the volume (energy density varies with the type of biofuel), overall biofuel consumption increased by 6.8% between 2018

and 2019. This growth is lower than that observed between 2017 and 2018 when consumption increased by 1.8 Mtoe (or 12.3%). An explanation that can be given for this lower growth is the greater use of biofuels that benefit from double accounting (see lower down). Without the UK, which withdrew from the European Union on 31 January 2020, biofuel consumption

Tabl. n° 1

Biofuels consumption for transport in the European Union in 2018 (in ktce)

Country	Bioethanol	Biodiesel	Biogas fuel	Total consumption	% compliant*
France	586.0	2 556.0	0.0	3 142.0	100.0%
Germany**	765.0	1 919.0	33.0	2 717.0	98.9%
Spain	158.6	1 579.7	0.0	1 738.3	100.0%
Sweden	131.5	1 249.8	118.5	1 499.7	100.0%
United Kingdom	397.3	913.0	14.1	1 324.4	100.0%
Italy	32.6	1 217.1	0.4	1 250.1	100.0%
Poland	172.8	739.6	0.0	912.4	100.0%
Netherlands	170.7	331.9	7.3	510.0	99.5%
Austria	57.9	423.1	0.3	481.3	97.1%
Belgium	93.6	362.1	0.0	455.8	100.0%
Finland	84.4	283.2	4.7	372.3	100.0%
Czechia	61.3	247.4	0.0	308.7	100.0%
Romania	90.4	206.6	0.0	297.0	100.0%
Portugal	7.6	272.3	0.0	279.9	100.0%
Denmark	42.9	171.0	5.2	219.1	100.0%
Hungary	50.2	141.8	0.0	192.0	100.0%
Bulgaria	28.6	132.3	0.0	160.9	100.0%
Greece	0.0	158.8	0.0	158.8	100.0%
Ireland	27.3	127.0	0.0	154.2	100.0%
Slovakia	17.6	127.9	0.0	145.4	100.0%
Luxembourg	10.0	111.0	0.0	121.0	100.0%
Lithuania	8.0	69.8	0.0	77.8	100.0%
Slovenia	6.7	65.3	0.0	72.0	100.0%
Latvia	8.5	27.7	0.0	36.1	100.0%
Croatia	0.4	26.6	0.0	27.0	100.0%
Estonia	4.9	12.3	3.3	20.5	100.0%
Malta	0.0	9.2	0.0	9.2	100.0%
Cyprus	0.0	9.0	0.0	9.0	100.0%
Total EU 28	3 014.6	13 490.6	186.8	16 692.0	99.7%
Total EU 27	2 617,4	12 577,5	172,7	15 367,6	99,7%

* Compliant with Articles 17 and 18 of Directive 2009/28/EC ** Germany biodiesel consumption figures include a consumption of pure vegetable oil consumed of 1 ktce.
Source: EurObserv'ER 2020

of the new EU of 27 only reached the 16 Mtoe threshold in 2019 (15.4 Mtoe in 2018), or 4.2% growth. This barometer's tables show the totals for the EU of 27 and 28. Almost all European Union biofuel consumption now complies with the sustainability criteria defined in the Renewable Energy Directive and is thus eligible for the Member States' binding

targets for renewable energy use in transport. Biofuel distribution in energy content has changed little from previous years' levels and is dominated by the biodiesel sector. If we include the UK, the biodiesel share reached 80.6% in 2019 compared to 18% for the bioethanol sector and 1.5% for the biogas fuel sector (graph 2). If we

leave out the UK, the distribution is very similar, namely 81.2% for biodiesel, 17.2% for bioethanol and 1.6% for biogas fuel.

The rise in quotas is good for all biofuels

The main reason for the increase in biofuel consumption is the rise in incorporation quotas (legal obligations), some

Tabl. n° 2

Biofuels consumption for transport in the European Union in 2019* (in ktoe)

Country	Bioethanol	Biodiesel	Biogas fuel	Total consumption	% compliant**
France	653.3	2 543.8	0.0	3 197.0	100.0%
Germany***	749.0	1 940.0	57.0	2 746.0	100.0%
United Kingdom	444.8	1 349.1	13.9	1 807.8	100.0%
Spain	129.4	1 592.5	0.0	1 721.9	100.0%
Sweden+	144.8	1 251.0	125.0	1 520.8	99.6%
Italy	30.4	1 245.7	40.9	1 317.0	100.0%
Poland+	183.2	836.4	0.0	1 019.7	100.0%
Netherlands	198.7	420.7	18.9	638.3	100.0%
Austria	56.5	414.5	0.4	471.4	99.9%
Belgium	106.3	352.8	0.0	459.1	100.0%
Finland+	88.4	340.1	5.0	433.5	98.8%
Czechia	72.9	266.9	0.0	339.8	100.0%
Denmark	55.2	239.7	5.2	300.1	100.0%
Romania+	91.4	206.6	0.0	298.0	100.0%
Portugal	4.2	274.2	0.0	278.4	100.0%
Hungary+	50.2	145.1	0.0	195.3	100.0%
Greece	23.9	167.9	0.0	191.8	100.0%
Ireland	26.2	161.9	0.0	188.1	100.0%
Bulgaria+	31.8	143.0	0.0	174.8	100.0%
Slovakia+	17.6	127.9	0.0	145.4	100.0%
Luxembourg	17.1	112.6	0.0	129.6	100.0%
Lithuania	9.8	65.5	0.0	75.3	100.0%
Slovenia+	6.7	65.3	0.0	72.0	100.0%
Latvia+	9.7	27.0	0.0	36.7	100.0%
Croatia+	0.4	26.6	0.0	27.0	100.0%
Estonia+	4.9	12.3	3.3	20.5	100.0%
Malta	0.0	11.1	0.0	11.1	100.0%
Cyprus+	0.0	9.6	0.0	9.6	100.0%
Total EU 28	3 206.7	14 349.7	269.6	17 826.0	99.9%
Total EU 27	2 761.9	13 000.6	255.7	16 018.2	99.9%

* Estimation. ** Compliant with Articles 17 and 18 of Directive 2009/28/EC *** Germany biodiesel consumption figures include a consumption of pure vegetable oil consumed of 1 ktep. Note: Biofuel consumption data for countries marked by a «+» were not available during the survey, EurObserv'ER made estimates taking into consideration the Eurostat «Energy Balance - early estimates» published in June 2020 Source: EurObserv'ER 2020

countries' incorporation targets (linked to motivational taxes) and other specific obligations made of the distributors (such as in Germany and Sweden, a fuel-wide obligation to reduce GHG emissions).

It should be remembered that the physical incorporation volumes may be limited by the demand for non-food crop-derived

biofuels that benefit from double accounting, that covers advanced biofuels, biofuels produced from used vegetable oils or animal fats. The consumption trend of biofuels that benefit from double accounting will be described in detail further on in this barometer.

On first analysis, this study takes stock of the trend in liquid and gaseous biofuel

consumption, without distinguishing between biofuels from crops traditionally intended for human or animal nutrition and those produced from waste and by-products of the forestry, agro-food, and farming sectors. Crops intended for human and animal nutrition also used

Tabl. n° 3

Biofuels consumption benefiting from double counting in 2018, indicative data for 2019 (in toe)

Country	2018			2019		
	Advanced biofuel *	Used cooking oil and animal fats **	Total 2018	Advanced biofuel *	Used cooking oil and animal fats **	Total 2019
United Kingdom	216 046	766 110	982 156	298 330	1 057 892	1 356 222
Italy	64 909	519 908	584 818	403 193	571 241	974 435
Germany+	8 118	783 000	791 118	8 118	783 000	791 118
Netherlands+	42 285	312 776	355 061	42 285	312 776	355 061
Sweden+	222 924	18 618	241 542	222 924	18 618	241 542
France	21 343	138 436	159 779	33 954	162 088	196 042
Finland+	193 089	0	193 089	193 089	0	193 089
Portugal	0	165 630	165 630	0	169 435	169 435
Ireland	4 336	125 302	129 638	5 231	160 919	166 150
Hungary+	0	93 000	93 000	0	93 000	93 000
Bulgaria+	11 245	42 264	53 509	11 245	42 264	53 509
Greece	0	34 451	34 451	0	35 741	35 741
Croatia+	26 635	380	27 015	26 635	380	27 015
Denmark+	8 567	15 667	24 234	8 567	15 667	24 234
Slovenia+	0	20 048	20 048	0	20 048	20 048
Belgium	4 987	18 891	23 877	6 027	11 809	17 837
Malta	0	9 046	9 046	0	11 072	11 072
Luxembourg+	0	10 529	10 529	0	10 529	10 529
Cyprus+	0	8 950	8 950	0	8 950	8 950
Estonia+	3 330	0	3 330	3 330	0	3 330
Spain+	0	2 388	2 388	0	2 388	2 388
Slovakia+	0	350	350	0	350	350
Austria	1 383	0	1 383	71	71	142
Poland+	0	0	0	0	0	0
Czechia	0	0	0	0	0	0
Romania+	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0
Latvia+	0	0	0	0	0	0
Total EU 28	829 197	3 085 743	3 914 941	1 263 000	3 488 239	4 751 239
Total EU 27	613 151	2 319 634	2 932 785	964 670	2 430 347	3 395 017

* Advanced biofuels means biofuels that are produced from the feedstock listed in Part A of Annex IX of the Directive (EU) 2018/2001. ** Biofuels that are produced from the feedstocks listed in Part B of Annex IX of the Directive (EU) 2018/2001. Note: The consumption data of biofuels benefiting from double counting for the countries marked with an «+» were not available for the year 2019 during our survey, by default EurObserv'ER used for the year 2019 the same consumption data as for 2018. The data for the EU 28 and EU 27 for 2019 for the consumption of these types of biofuels therefore remain indicative. Source: EurObserv'ER 2020

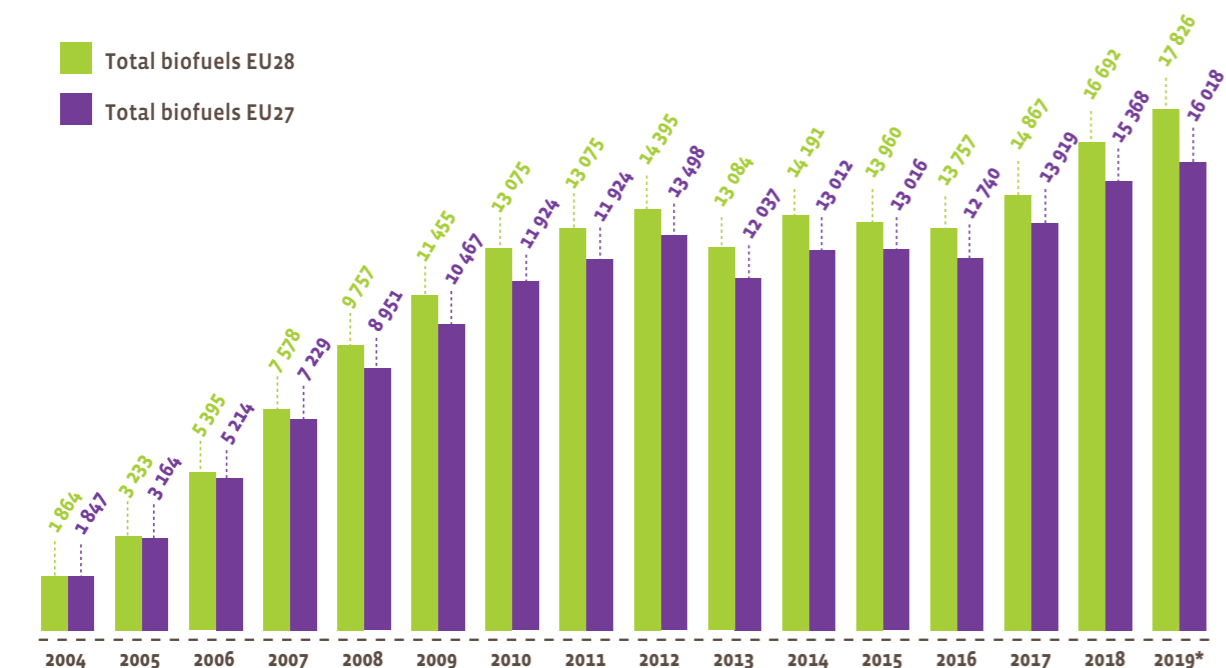
for producing biofuel include all oily crops such as rapeseed, palm oil, soy, sunflower and others used in biodiesel manufacture and saccharose-rich crops (beetroot, sugar cane, etc.) and starchy crops (wheat, maize, potato, etc.) that can be processed to produce bioethanol. In 2019, most of the increase in biofuel consumption came from the biodiesel sector, both the traditional Fatty Acid Methyl Ester (FAME) and synthesis (HVO) sector obtained by hydrotreatment of vegetable oils or animal fats. According to EurObserv'ER, biodiesel consumption exclusively dedicated to transport rose to at least 14 348.7 ktOE in the EU of 28 in 2019, which amounts to a year-on-year increase of 6.4% and equates to 859.1 ktOE of additional consumption. The main explanation for this growth is that between 2018 and 2019, various European Union countries implemented legal increases in their biofuel incorporation rates. Thus, Spain's incorporation rate (the same for bioethanol and biodiesel) rose in energy content from 6% in 2018 to 7% in 2019, in Poland it rose from 7.5 to 8% (common rate), in Italy from 7 to 8% (common rate) and in the Netherlands

from 8.5 to 12.5% (common rate). In the UK, which in 2019 was still in the EU, the incorporation rate, this time in volume, rose from 7.25% from 14 April 2018 to 9.18% over the calendar year 2019. When the biofuel incorporation obligations are common (no distinction made between biodiesel and bioethanol), the increase in biodiesel consumption is generally higher, because of the size of the market share of diesel-powered vehicles on the market. For its part, bioethanol consumption dedicated to transport, either directly blended with petrol or previously converted into ETBE (a blend of bioethanol with an oil refining by-product isobutene), increased by 6.4% between 2018 and 2019 to reach 3 206.7 ktOE (168.2 ktOE more). The details of the data collected for 2019 show that bioethanol consumption is increasing in France, the UK, Sweden, Poland, the Netherlands, Greece, and Belgium. According to EurObserv'ER, impending consolidations are likely to raise the bioethanol consumption figures of some Central European countries. The incorporation obligation in energy content in the petrol sector has risen in

Romania from 4.5% in 2018 to 8% in 2019, and from 4.9% in 2018 to 6.4% in 2019 for Hungary. France is one of the countries that has increased its bioethanol fuel consumption the most. Its incorporation rate has risen from 7.5% in 2018 to 7.9% in 2019. Another reason for this increase is that E-10 fuel can now be found widespread in filling stations. In the UK, the reason for the rise is an adjustment to the new biofuel incorporation policy that is a little more favourable to bioethanol. The increase in the Netherlands can be ascribed to the increase in mandates (common to biodiesel). In Greece, it is the implementation, for the first time, of a 1% bioethanol incorporation target in petrol in 2019 which boosted consumption. In 2020, the Greek threshold will rise to 3.3%. In contrast, bioethanol consumption slipped slightly in Spain, Germany, Portugal, Austria, and Ireland in 2019. Despite the increase in Spain's common incorporation rate, stronger demand for diesel fuel provides the reason for this relative stagnation. In Germany, the status quo between 2018 and 2019 with

Graph. n° 1

European Union (EU-28, EU-27) biofuel (liquid and biogas) consumption trends for transport in ktOE.



* Estimation. ** Compliant and no compliant biofuels. Sources: data from 2004 to 2017 (Shares 2020); 2018-2019 (EurObserv'ER 2020)

regard to the GHG reduction constraint did not act in favour of bioethanol consumption. Nonetheless, it could pick up in 2020 because the road fuel GHG reduction obligation will change from 4 to 6% in 2019.

Biogas fuel is preferred in Sweden and Italy

As for biogas fuel consumption (biogas purified until an equivalent quality to that of Natural Gas is obtained) meant for NGV (Natural Gas Vehicle) motorisations, is now identified in 9 countries. Some

countries view biogas fuel as a strategic priority for achieving the renewable target share in transport by the 2030 timeline. This particularly applies to Sweden and Italy whose legislation encourages its use in transport, at the expense of other applications such as cogeneration (electricity, heat).

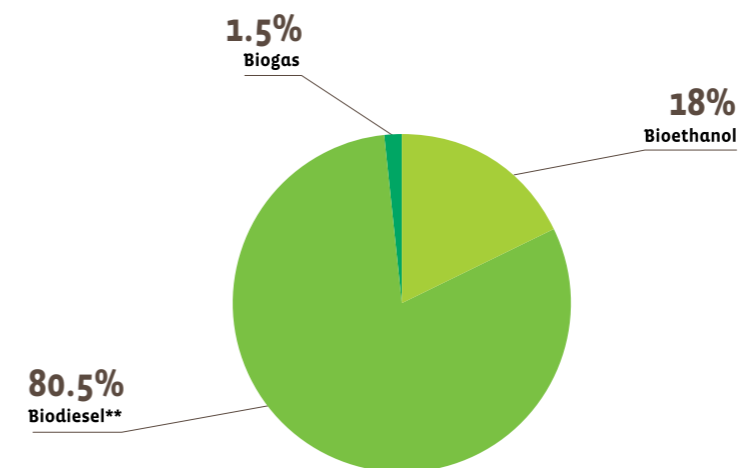
Biogas fuel consumption in the EU of 28 surged in 2019, rising from 186.8 ktOE in 2018 to 269.6 ktOE (by 44.3%). Growth was primarily driven by Italy, which, the GSE claims, rose from 0.4 to 40.9 ktOE in a single year. By the way, a major part of

this consumption benefits from double accounting because it is directly converted from the breakdown of solid municipal waste. The rise can be ascribed to the adoption of a "biomethane" decree on 2 March 2018 to promote its use to increase the green fuel share in the Italian transport sector. In more detail, the decree allocated 4.7 billion euros worth of funds to installations (new and existing) that introduce biogas recovery systems to biomethane provided they are up and running by 2022. The fund covers a maximum of 1.1 billion Nm³ of annual production. Accordingly, the gas distributors are bound to include these biofuels in their offer and favour domestically-produced biofuels. The development potential of biogas fuel is aided by the fact that Italy has the highest number of NGV vehicles in Europe (about 1 million) and the most developed NGV distribution network (1 300 distributors). The Italian National Integrated Energy and Climate Plan (PNEC) also sets out to make biogas fuel the main renewable energy contributor in transport (road and rail) in 2030, ahead of renewable electricity and the other types of liquid biofuels.

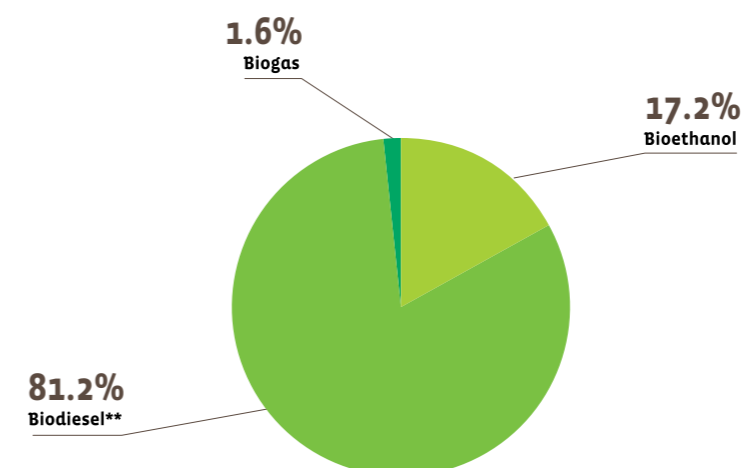
This new biogas-centred strategy implemented by Italian government is the same as the one Sweden rolled out in the first decade of the millennium. Sweden is still Europe's leading biogas fuel consumer. Data published by Statistics Sweden in March 2020 shows that biogas fuel consumption rose from 142 million Nm³ (normal m³) in 2018 (which equates to 118.5 ktOE) to 150 million Nm³ in 2018 (125 ktOE). At the end of 2019, Sweden had 193 public filling stations delivering biogas (185 in 2017), as well as about sixty non-public stations for use by local authorities, public transport, and company vehicle fleets. The biogas share of consumption of vehicles running on gas was about 95% in 2019. The country also has a policy to develop the use of liquified methane gas for long-distance heavy goods vehicles. The use of liquified methane gas of about 4 GWh in 2018, rose to 23 GWh in 2019 (about 2 ktOE), including 46% of liquified biomethane (about 781 tonnes out of a total of 1 674 tonnes). This output results from the recent construction of the biogas

Graph. n° 2

Breakdown of total EU 2019* biofuel consumption in energetic content for transport by biofuel type in EU28



Breakdown of total EU 2019* biofuel consumption in energetic content for transport by biofuel type in EU27



* Estimation. ** Oil vegetable consumed pure include in the biodiesel figure. Source: EurObserv'ER 2020.



UPM has been operating an advanced biofuel in Finland for five years. The refinery produces biodiesel from a wood-based feedstock, raw tall oil. Current biofuel output stands at about 160 million litres.

liquefaction plant at Lidköping with a design capacity of 13 tonnes per day, by Air Liquide. The new plant is the fruit of a joint effort between the Swedish companies Biogas international Lidköping AB and Göteborg Energi AB, together with the town of Lidköping.

4.8 Mtoe of biofuels benefit from double accounting

According to EurObserv'ER, the use of biofuel that benefits from double accounting increased strongly in the European Union of 28 in 2019, posting at least 21.4% of growth compared with its 2018 level. In 2019, the increase was

boosted by a surge in the consumption of this type of fuel in Italy and the UK. The provisional data gathered for this study (survey conducted in July 2020), puts the consumption of biofuels benefitting from double accounting at >4.8 Mtoe in 2019 in the EU of 28 (namely, 3.5 Mtoe of used frying oils or animal fats and 1.3 Mtoe of advanced biofuels). In 2018, this figure was 3.9 Mtoe, i.e. 3.1 Mtoe of biofuel produced from used frying oil or animal fat and 0.8 Mtoe of advanced biofuel. Thus, biofuels benefitting from double accounting made up most of the increase in the European Union's 2019 total biofuel consumption, mainly through the

development of HVO biodiesel. The consumption share of biofuels that benefit from double accounting has started to overtake that of biofuels that benefit from single accounting in some countries like the UK, and more recently Italy.

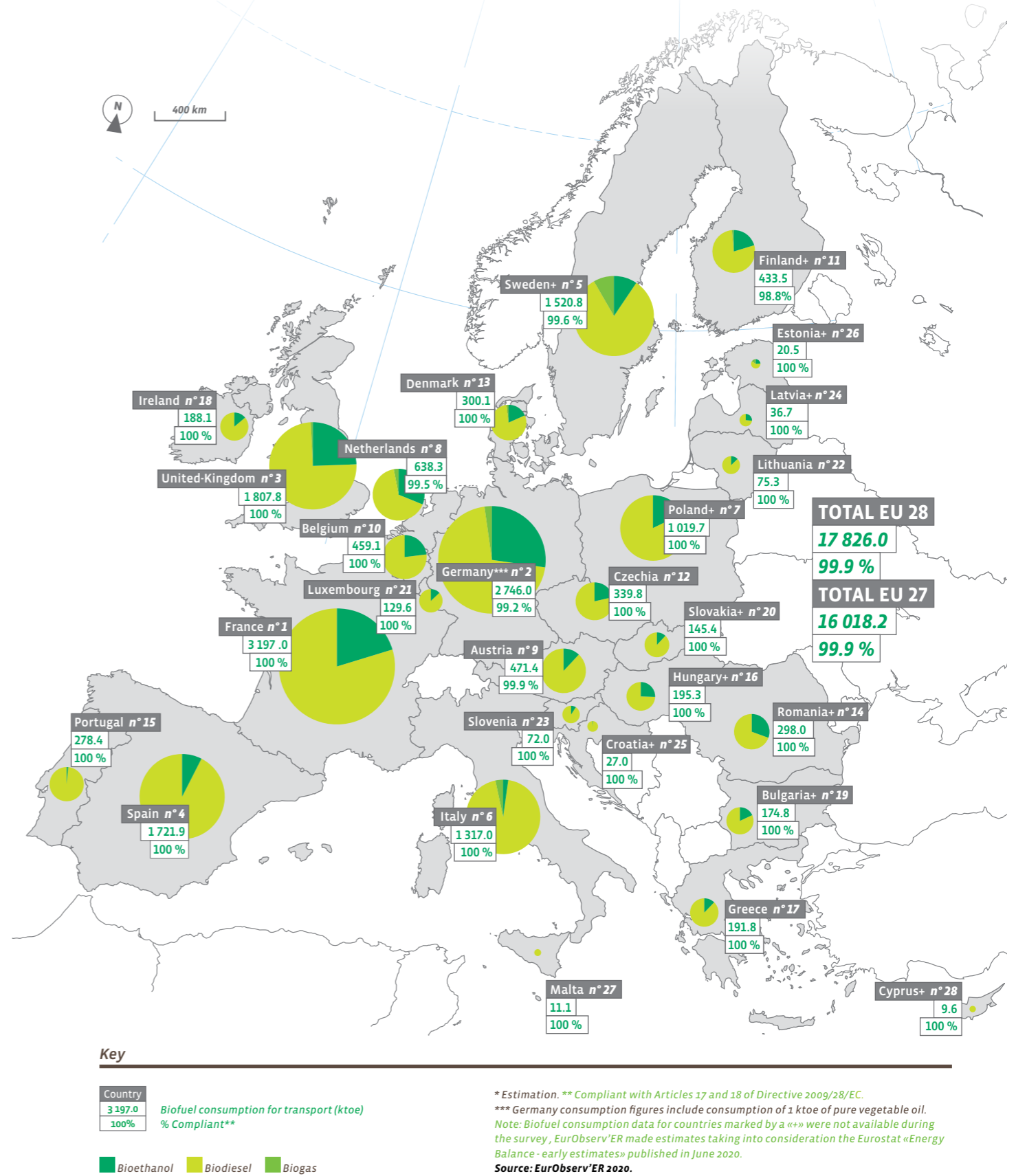
In the course of a year, Italy, for example, has significantly modified the distribution of its biofuel consumption between those that benefit from single accounting that only made up 26% in 2019 (more than half of which comes from imported palm oil) and biofuels that benefit from double accounting which in 2019 made up 74% of consumption (including 43.4% of non-advanced biofuels, oils and animal fats and used oil) and 30.6% of advanced biofuels. Provisional data from the BEIS (Department for Business, Energy & Industrial Strategy), put the share of biofuels benefitting from double accounting in the UK at 75% including 58.5% of non-advanced biofuels and 16.5% of advanced biofuels.

If we focus on biofuels produced from used oils and animal fats, their consumption in the UK according to the BEIS exceeded one million toe (from 761.1 ktoe in 2018 to 1 057.9 ktoe in 2019, or 38.1% growth over 2018). They reached 571.2 ktoe in Italy according to GSE (the energy service system operator), 162.1 ktoe in France (17.1% up on 2018), according to SDES (Sustainable Development Ministerial Statistical Department) and 160.9 ktoe in the Republic of Ireland in 2019 (28.4% more than in 2018), according to SEAI (the Sustainable Energy Authority of Ireland).

It is a little harder to put a precise figure on the growth in consumption of "advanced biofuels", as certain major consumer countries such as Sweden (222.9 ktoe in 2018) (primarily based on tall oil), Finland (193.1 ktoe in 2018) (based on tall oil and sawdust), the Netherlands (42.3 ktoe in 2018) had not officially released its 2019 figures at the time of the study. Moreover, these countries are likely to export part of their output. However, our survey shows that in the major consumer countries such as Italy and the UK, and to a lesser extent in France and Belgium, advanced biofuel consumption is surging.



Biofuels consumption for transport in the European Union in 2019* (in ktoe)



In Italy, according to data from GSE (Gestore dei Servizi Energetici), detailed in its “Energia Nel Settore Trasporti 2005-2019” publication, advanced biofuel consumption in transport rose from 64.9 ktoe in 2018 to 403.2 ktoe in 2019, which is more than a six-fold increase (521.2%). This increase can be ascribed to the larger-scale use of palm oil refinery effluents (from 30 ktoe in 2018 to 186 ktoe in 2019), by increased recovery of feedstocks from the “industrial waste and other waste” category (from 33 ktoe in 2018 to 173 ktoe in 2019), the inclusion for the first time in 2019 of the biomethane output produced from the organic fraction of solid municipal waste (used directly as fuel for bus and truck fleets – 37 ktoe in 2019), and also raw glycerine (5 ktoe), wine lees and pomace (1 ktoe) and tall oil (1 ktoe). The UK is also a major consumer (and importer) of advanced biofuels. According to the provisional figures of the BEIS (Department for Business, Energy & Industrial Strategy), UK consumption of advanced biofuels should settle at about 300 ktoe for 2019 (298.3 ktoe in 2019 compared with 216 ktoe in 2018), or 38.1%

growth. The consumption level is lower in France. According to the SDES, advanced biofuel consumption stood at 34 ktoe in 2019 (21.3 ktoe in 2018) – or 59.1% growth. The upswing in advanced biofuel consumption will continue in 2020 and years to come. This is because several European Union countries have implemented obligations to incorporate advanced biofuels or upwardly revised their targets. In Italy, the incorporation rates of advanced biofuels were redefined by the 19 March 2018 decree on the promotion of biomethane and other advanced fuels in the transport sector. The rate was raised to 0.8% in 2019 and will increase to 0.9% in 2020, 1.5% in 2021 and 1.85% from 2022 onwards. The decree stipulates that the binding quota for advanced biofuels is set at 75% for advanced biomethane and 25% for the other advanced liquid biofuels. In France, the 2023-2028 PPE (multi-annual energy programming) has set the incorporation targets for advanced biofuels to the 2023 and 2028 timelines. They were set at 1.2% for the petrol sector and at 0.4% for the diesel sector in 2023, and

at 3.8% for the petrol sector and at 2.8% for the diesel sector in 2028. The aim is to take the advanced biofuel share to 5 TWh in 2028, which equates to 430 ktoe (3.35 TWh in diesel and 1.65 TWh in petrol, with no multiplying factor). In 2018, the Netherlands also introduced an obligation for advanced biofuels produced from waste (excluding frying oil and animal fats). The rate was 0.6% in 2018, 0.8% in 2019 and 1.0% in 2020. In January 2019, Finland approved a law that took the advanced biofuel incorporation rate to 2% in 2023 and 10% in 2030. A 0.9% incorporation rate will also be compulsory in Denmark from 2020 onwards in transport. Advanced biofuel incorporation rates have already been planned at lower levels from 2019 onwards in Slovakia and since 2020 in Germany and Bulgaria.

THE ADVANCED BIOFUEL INDUSTRY PREPARES TO MEET DEMAND

The biofuel sector’s industrial momentum is largely driven by the HVO biodiesel segment... an innovation that has

Tabl. n° 4

Cellulosic bioethanol production units in operation, under construction and planned

Company	Status	City	Country	Start-up year	Installed capacity (Tons/year)*
SEKAB Biorefinery Demo plant	In operation	Ornskoldsvik	Sweden	2004	160
Chempolis Ltd. Biorefining plant	In operation	Oulu	Finland	2008	5 000
Clariant Sunliquid	In operation	Straubing	Germany	2012	1 000
IFP Futurol	In operation	Bucy-Le-Long	France	2016	350
St1 Cellulonix Kajaani	In operation	Kajaani	Finland	2017	8 000
Versalis group Eni, former Beta Renewables/Biochemtex facility	In operation	Crescentino	Italy	2020 (restart)	40 000
AustroCel Hallein	Under construction	Hallein	Austria	2020-2021	30 000
Clariant Romania	Under construction	Podari	Romania	2021	50 000
Sainc Energy Limited	Planned	Villaralto	Spain	2022	25 000
Kanteleen Voima Nordfuel biorefinery	Planned	Haapavesi	Finland	2022-2023	65 000
St1 Cellulonix Kajaani 2	Planned	Kajaani	Finland	2024	40 000
St1 Cellulonix Pietarsaari	Planned	Pietarsaari	Finland	2024	40 000
St1 Cellulonix Follum	Planned	Ringerinke	Norway	2024	40 000
INA	Planned	Sisak	Croatia	n.c.	55 000
Enviral Leopoldov site	Planned	Leopoldov	Slovakia	n.c.	50 000
ORLEN Poludnie	Planned	Jedlicze	Poland	n.c.	25 000

* Estimation, EurObserv'ER research. Source: EurObserv'ER 2020

enabled the oil industry with actors like Neste, Preem, Repsol, Cepso, Eni, Total and St1 to regain lost market shares. It has also enabled the major forestry product suppliers (UPM, SCA) to enter this market as they have the opportunity to reclaim by-products relating to their activity such as tall oil and the pyrolysis oil derived from lignin. The HVO segment is developing just as fast as it uses vast quantities of feedstocks likely to benefit from double accounting, whose European demand is surging, such as used oils and forestry by-products in addition to traditional food crop oils (palm oil, rapeseed and others). The European Union’s HVO biodiesel production capacity stood at about 5.1 billion litres at the end of 2019. This production capacity should increase considerably in the next three or four years, as most of the players in this market have announced new investments.

The majority of the capacity increases in 2019 result from the commissioning of two major biorefineries, both of which are oil refinery conversions by the petroleum companies Eni and Total. In July 2019 Total commissioned its La Mède biorefinery (in the Bouches du Rhône, France) with maximum annual production capacity of 640 million litres. The site feedstocks will break down into about 60-70% of raw plant oils (rapeseed, palm, sunflower), the remainder consisting of waste reprocessing (animal fats, cooking oils, residual oils), and thus will benefit from double accounting in the energy targets of the consumer countries. Eni’s biorefinery at Gela, Sicily, went on stream in August 2019. The plant can process up to 720 000 tonnes per annum of used plant oil, frying oil, fats, algae, and waste products intended for biodiesel production. It cost 294 million euros to convert the refinery. A further 73 million

euros of investments must be added to cover additional preparatory works and the construction of future biomass pre-treatment equipment, that should be completed by the third quarter of 2020. Eni also intends to increase the production capacities of its second biorefinery that has been operating on the Venice site since 2014 (325 million litres), to turn it into a plant capable of producing second-generation HVO. A new upgrade in 2021 should raise the plant’s processing capacity to 600 000 tonnes, with increasing levels of feedstocks from food production waste, such as used oils, animal fats and by-products of palm oil conversion. The site’s production capacity could thus rise to 715 million litres of HVO biodiesel.

Preem, Sweden’s biggest petroleum company, recently raised the production

Tabl. n° 5

HVO type biodiesel production units in operation, under construction and planned

Company	Status	City	Country	Start-up year	Installed capacity (Tons/year)*
Neste	operational	Kilpilahti, Porvoo	Finlande	2007 and 2019	380 000
Neste	operational	Rotterdam	Netherlands	2011	1 000 000
CEPSA	operationnal, co processing HVO	Huelva Algeciras-San Roque, Tennerife	Spain	2011	n.a.
REPSOL	operationnal, co processing HVO	La Coruña, Tarragona, Bilbao and Cartagena	Spain	2013	n.a.
ENI	operationnal	Porto Marghera, Venice	Italy	2014 (ext 2021)	253 500 (ext 420 000)**
UPM Lappeenranta ***	operational	Lappeenranta	Finlande	2015	100 000
Preem	operationnal, co processing HVO	Gothenburg	Sweden	2015 (ext 2023)	170 000 (ext 1 000 000)
Galp	operationnal, co processing HVO	Sine	Portugal	2017	40 000
ENI	operationnal	Gela	Italy	2019	600 000
TOTAL	operationnal	La Mède	France	2019	500 000
ST1	Planned	Gothenburg	Sweden	2022-2023	200 000
REPSOL Valle de Escombreras	Planned	Cartagena	Spain	2023	250 000
SCA Östrand***	Planned	Östrand	Sweden	2024	280 000
UPM Kotka***	Planned	Kotka	Finland	2024	500 000

* Estimation, EurObserv'ER research. For certain capacity data expressed in liters, EurObserv'ER used an equivalence ratio of 1 ton HVO = 1,282 liters HVO.
 ** Processing capacity of 360,000 tonnes increased to 600,000 tonnes in 2021. *** Large-scale plants for hydrotreatment of up-graded lignocellulosic materials.
 Source: EurObserv'ER 2020

capacity of its Gothenburg HVO biodiesel site to 220 million litres, whose main feedstock is tall oil. The company announced its strategic vision to raise its renewable fuel production to 3 billion litres (3 million m³) by 2030. The company is now looking for new raw material supplies to achieve this. Incidentally, Preem announced in March 2020 that it had chosen Haldor Topsoe's HydroFlex™ process for its new advanced biofuel production unit that is scheduled to go on stream in 2024. It aims to produce 1 billion litres (including aviation fuel), to cover 25% of Sweden's renewable fuel needs in 2030. This new plant will use tall oil, animal fats and other renewable feedstocks. Preem has also signed a letter of intent with Scandinavian Airlines System (SAS) to supply it with sustainable aviation fuel. Still in Sweden, in September 2019, St1 the renewable energy oil refiner and producer together with the forestry company SCA announced they were investing 200 million euros in a new biorefinery near Gothenburg. It is due to come on stream in 2022 with an annual production target of 200 000 tonnes of HVO biodiesel biofuel in addition to aviation fuel and naphtha, all from tall oil. Further east, the Finnish forestry company UPM has an HVO biodiesel production plant at Lappeenranta, with 120 million litres of capacity, also fed with tall oil, a by-product of its papermaking activity. UPM announced that it was looking into the possibility of opening a new production plant at Kotka designed to produce 550 million litres (500 000 tonnes) with the aim of reclaiming forest waste such as sawdust and branches. Commercial-scale projects to produce biofuel from cellulosic ethanol (using cellulosic biomass such as straw or sawdust) are also seeing the light of day, in the wake of the commissioning of the first pilot projects each of which is developing one of these specific processes (Sunliquid, Proesa, Cellunolix, SEKAB'S cell app, Futurol, etc.). In Austria, the AustroCel Hallein's new cellulosic ethanol plant should be up and running by the end of 2020. It announces annual production capacity of 30 million litres of ethanol using wood pulp (about 1% of the country's oil consumption). For its part, the Swiss chemicals group Clariant is finalising the construction of a cellulosic

ethanol plant based on its Sunliquid technology in Podari in Southwest Romania (commissioning scheduled in 2021). More than 100 million euros of investment were ploughed into this plant with its annual production capacity of 50 000 tonnes and it has received 40 million euros of European Union funding. Its feedstock will consist of locally produced crop residues such as wheat straw. Clariant signed another licensing agreement for its «Sunliquid» biofuel in September 2017 with Enviral, a Slovakian company and member of the Envien group, with a view to constructing a 50 000-tonne cellulosic ethanol plant in Slovakia near the town of Leopoldov. A further agreement has been signed with the Polish group Orlen for a 25 000-tonne plant near the town of Jedlicze. In Finland, in the city of Kajaani, St1 Biofuels Oy in conjunction with North European Bio Tech Oy, commissioned a cellulosic ethanol plant in 2018 (Cellunolix Kajaani project) with annual capacity of 10 million litres (8 000 tonnes). In this case, the feedstock is sawdust. St1 also announced its intention to start up three new plants by 2024, each with 40 000 tonnes of capacity, a second unit at Kajaani, another at Pietarsaari, Finland, and the third at Ringerike, Norway. Italy's chemicals company Versalis (Eni group) announced on 8 February 2020 that cellulosic ethanol production would be restarted at the Beta renewables site of Crescentino (40 000 tonnes of capacity) during the first half of 2020. The complex, which included the Biochemtex, Beta Renewables, IBP Energia and Bio product production plants of the industrial group, Mossi & Ghisolfi, was put up for auction in 2018 after the group filed for bankruptcy. Versalis has modernised the bioethanol production plant by investing more than 15 million euros. The plant uses Proesa proprietary technology. There are two other significant cellulosic bioethanol projects we would like to mention: one led by Sainc Energy Limited for a biorefinery at Villaralto, Spain (25 000 tonnes of capacity) that is scheduled to go on stream in 2022. It will use the raw lignin oil obtained from pruning olive trees. The second is the Nordfuel project to construct a second-generation biorefinery in Finland near the town of Haapavesi. The project aims

In Finland, a cellulosic ethanol plant in 2018 with annual capacity of 10 million litres was commissioned in 2018. It uses sawdust as its feedstock. This project, known as Cellunolix, is jointly managed by St1 Biofuels Oy and North European Bio Tech Oy.



for 65 000 tonnes of annual production of cellulosic bioethanol (using the SEKAB'S CelluApp process) in addition to 250 GWh of "advanced" biogas. It will be the biggest biogas production centre in the Nordic countries. The investment decision is scheduled for 2021 and the construction in 2022-2023. Biofuels produced by a gasification process of solid household waste or produced from biomethane are also an avenue being examined by the industry. They also pave the way for advanced fuels to use other waste, i.e. not strictly organic waste, by using a wider spectrum of solid household waste. For example, the W2C project bringing together a consortium consisting of Enerkem from Canada, the petroleum company Shell, Air Liquide, Nouryon and the Port of Rotterdam envisages constructing a

solid municipal waste treatment plant for the purpose of producing bio-methanol at Rotterdam. The facility should convert 360 000 tonnes of non-recyclable waste (organic and plastic waste) into 270 million litres of bio-methanol (220 000 tonnes). It was initially planned that this plant would be commissioned in 2022, but the final investment decision has yet to be announced. A similar project (Ecoplanta Molecular Recycling Solutions), to convert household waste to energy is also announced for 2022. It is again led by Enerkem this time with the Suez Group. The site will be located at El Morell, Spain, and have 265 000 tonnes of production capacity for an investment of 250 million euros. Incidentally, the Dutch group, BioMCN, has a plant that produced 75 million litres of bio-methanol from biogas in 2018.

2020... A SPECIAL YEAR

Consumption of sustainably certified biofuel and biogas, originating from food crops (single accounting) or waste or by-products (double accounting) should have increased considerably in 2020, with potentially double-digit growth. This expected increase was directly related to the increase in national incorporation mandates and other specific obligations on distributors that were implemented so that compliance with the binding target of 10% of renewable energy in transport for each Member State would be achieved. By way of example, between 2019 and 2020, the compliant fuel incorporation obligations, in energy content, will rise from 8.5 to 9.9% (identical rates applied to biodiesel and bioethanol) in Belgium, from 18 to 20% in Denmark, from 7.9 to

8.2% for bioethanol and 7.9 to 8% for biodiesel in France, from 8 to 9% in Italy, from 7 to 8.5% in Spain, from 12.5 to 16.4% in the Netherlands and 7 to 10% in Portugal. However, the Coronavirus health crisis hit the demand for transport fuel for many weeks. Through the introduction of teleworking and as business activities idled, much local regional and even international travel was cancelled. It is highly likely that the economic slowdown due to the global disruptions arising from COVID will continue to hit petrol and diesel consumption through the second half of 2020 and even into 2021. Indirectly, it is almost certain that this situation will have negative consequences for the European Union's biofuel producers, despite the increase in incorporation rates.



Some analysts including IHS Market, estimate that the health crisis has slightly reduced European biodiesel demand since the month of April 2020, leading to a loss of 2 million tonnes compared with demand under normal conditions. The IHS analysts also expect the bioethanol fuel market to be hit harder than that of biodiesel because petrol-driven passenger vehicles will bear the brunt of the slowdown. The drop in demand has already driven down prices and certain producers have announced that they are reducing their production levels. Another report from the USDA Foreign Agricultural Service is in the same vein. It

anticipates a ±12% drop in fuel consumption in transport, and respective drops in the consumption of bioethanol and biodiesel of 10 and 6% for 2020. To make matters worse, some uncertainties surround several Central and Eastern European countries' intentions to award exceptional incorporation obligations waivers in 2020, through exceptional measures to combat the economic implications of coronavirus. Romania has authorized waivers affecting the blending of fossil fuels in its order of 9 April 2020. As local production cannot cover demand, its government justifies this waiver citing the delay in imports

because of the restrictions imposed by other European States. The biofuel players of Bulgaria, the Czech Republic, Hungary, Poland and Slovakia published a joint press release to alert the European Commission of certain governments' plans to suspend the incorporation obligations, notwithstanding the economic consequences for the sectors, be they for biofuel production or the animal nutrition sector (rapeseed meal, beetroot pulp, brewers' grains). Whatever happens, over the next decade, the new Renewable Energy Directive has implemented a new rationale for renewable energies in transport,

primarily limiting the share of agro-fuels by the 2030 timeline and favouring the use of advanced biofuels along with electric mobility. Yet, the new target of 14% in 2030 (double accounting permitting) cannot be directly compared with the 10% target set for 2020, as it will have to be calculated using different criteria (minimum share of advanced fuels and limitation of the use of agro-fuels and feedstocks such as used oils). Furthermore, this target is meant for the energy product suppliers of the transport sector of each Member State and is not designed to be a national target. As for national renewable energy consumption prospects in transport, each State was obliged to draw up a planning document called the National Integrated Energy and Climate Plan (NIEC), defining its own contributions to achieve the 2030 targets set by the Clean Energy package for all Europeans. Given that transport uses a third of the total final energy within the EU and that most of this energy comes from oil, many European Union

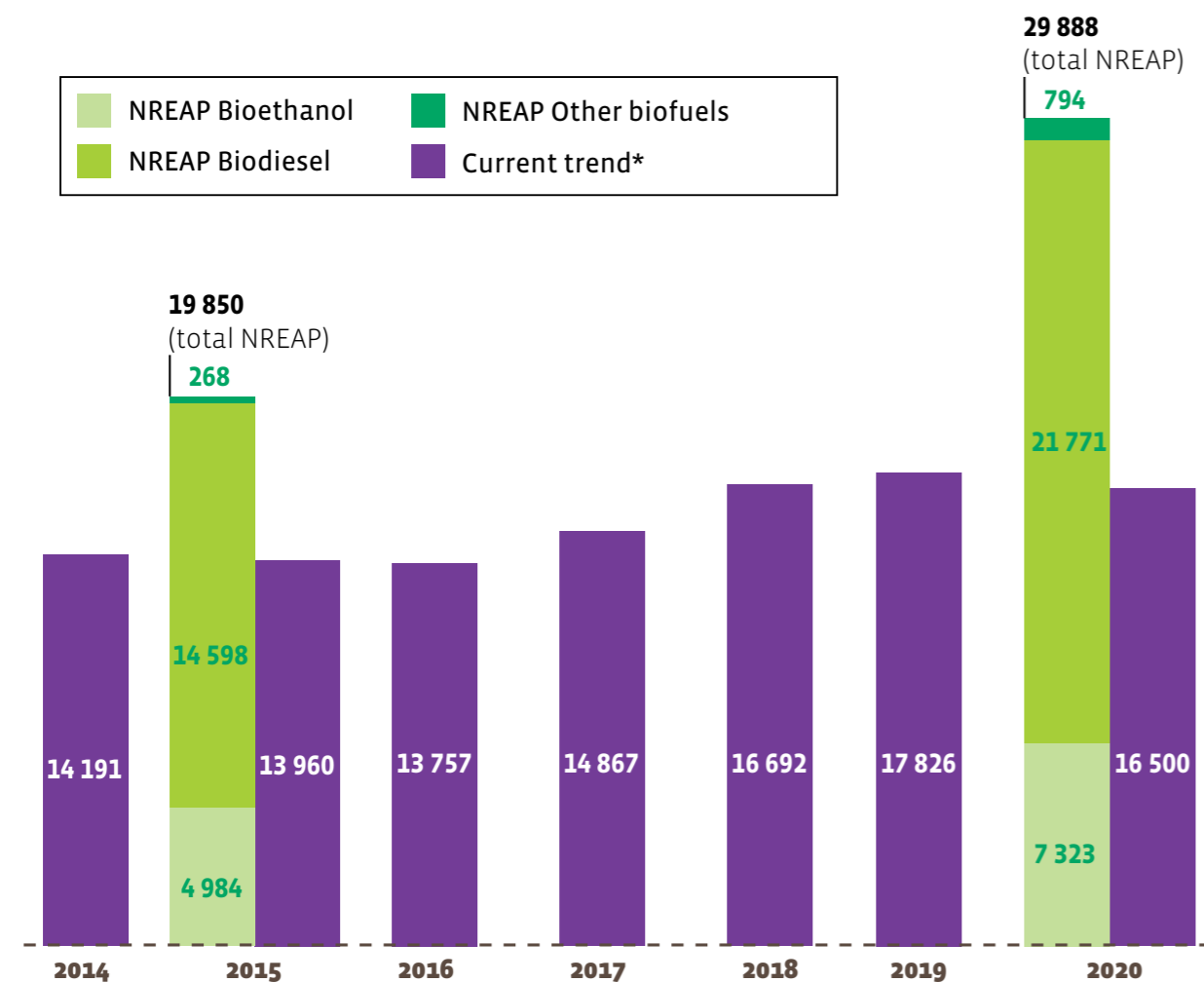
countries are banking on acting on this sector and prioritizing it by setting much higher decarbonation targets than those imposed by the Directive. By way of illustration, the Italian NIEC plans for an obligatory renewable quota in transport for operators of as much as 22% by 2030 (intermediate target of 14.4% in 2025), namely much higher levels than the 14% envisaged by RED II. Spain's plan has set an indicative target of 28% of renewable energies in transport in 2030 – a figure that is double the 14% required by the Directive. Germany presents an indicative path for the transport sector of 27%. Sweden, a trailblazer, has set an indicative renewable energy target in transport of 65% in 2030 as well as a 70% GHG emission reduction target compared to its 2010 level (excluding air transport). All these indicative thresholds are only a step because the carbon neutrality target by the 2050 timeline implies the almost complete decarbonation of the transport sector, either by going over to electric motorisation, or

to biofuel and biogas. The technological challenge of these various types of motorisation to contributing to carbon neutrality is already being tackled by the industrial mobility players. This offers hope for good prospects in the future. □

Sources used: CGDD/SDES (France), AGEE-Stat (Germany), Ministry for the Ecological Transition (Spain), BEIS (United Kingdom), GSE (Italy), Statistics Netherlands, Statistics Austria, FPS (Belgium), DGEG (Portugal), Ministry of Industry and Trade (Czech Republic), ENS (Denmark), CRES (Greece), SEAI (Ireland Republic), STATEC (Luxembourg), Statistics Lithuania, NSO (Malta), EurObserv'ER estimation.

Graph. n°3

Comparison of the current biofuel consumption for transport trend against the NREAP (National Renewable Energy Action Plan) roadmaps in EU28 (ktoe)



* Biofuel consumption compliant and not compliant. Source: EurObserv'ER 2020.

The next barometer will cover heat pumps.



This barometer was prepared by Observ'ER in the scope of the EurObserv'ER project, which groups together Observ'ER (FR), TNO Energy Transition (NL), RENAC (DE), Frankfurt School of Finance and Management (DE), Fraunhofer ISI (DE) and 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.