Jean-Claude Moschetti/AlgoSolis/CNRS Photothèque

Algae growth in an open-channel raceway

+ 9.2 %

The increase of biofuels consumption for transport in the European Union between 2016 and 2017 (in energy content)

BIOFUELS BAROMETER

A study carried out by EurObserv'ER.

EurObserv'ER

Agreements on the broad lines of the future renewable energy directive, REDII, have brought the period of uncertainty surrounding the future of biofuel to a close. Its clarifications and the proposed development framework should improve the sector's structure in the fundamental sense of the forthcoming climate energy package goals... namely in the combat against climate warming. This expected outcome is borne out by the biofuel consumption figures in transport. Following several years of stability, it picked up steam in 2017 (rising by 9.2%), to reach 15.5 Mtoe.

80.7 %

Biodiesel part in the total biofuel consumption in EU transport in 2017 (in energy content)

15.5 Mtoe

Total biofuel consumption in EU transport in 2017

BIOFUELS BAROMETER – **EUROBSERV'ER** – SEPTEMBER 2018

Time has been taken to analyse and consult on renewable energies' contribution in transport and define an acceptable allowance for "agrofuels" (produced from food crops) in this contribution. After 5 months of intense negotiations, and a final informal overnight meeting held in Strasbourg from 13–14 June 2018, the European Council, the European Parliament and the European Commission, thrashed out the broad lines of the new renewable energy directive (RED II). The renewable energies target in total final energy consumption for 2030 was set at 32% with a 14% share of renewable energy in transport. Nonetheless the parties committed to re-examining the possibility of upscaling the target for 2023. It was decided to maintain the maximum contribution of agrofuels, biodiesel and bioethanol produced from food crops for transport at 7%, which is the same as the 2020 limit adopted for the ILUC directive (2015/1513) of 9 September 2015. RED II has also set binding targets for the incorporation of advanced biofuel, not derived from food crops, with a minimum share of 1% in 2025 and 3.5% by 2030.

The palm oil issue has also been settled. Palm crops had incensed the European market because of their contribution to the ILUC effect (Indirect land use change) and the fact that their extensive culture causes widescale deforestation in Indonesia and Malaysia and, worse still, the collapse of biodiversity. Biodiesel produced from high ILUC risk biofuels is to be frozen at 2019 levels and gradually reduced as of 2023 down to zero in 2030. This compromise finally protects the interests of the producers and farmers who invested in the first-generation sectors, while firmly capping agrofuel development.

Indirect land use change (ILUC effect)

This phenomenon refers to the planting of an energy crop instead of a food crop which will then be displaced by being substituted for carbon-rich ecosystems such as primary forests or natural meadows. In a free-exchange context, the introduction of a binding biofuel incorporation rate in the EU has led some countries to position themselves on this global biofuel market. This has resulted in an increase in CO_2 emissions at a planetary scale causing deterioration of biodiversity as the corollary, in some of the world's regions.

While the producers of first-generation biofuel do not question the ILUC effect, they disagree with the modelling used to measure its effects. The difficulty is down to the fact that the lands intended for producing agrofuels also produce co-products (soy cakes, rapeseed, etc.) intended for animal feed and therefore indirectly for human nutrition. By the same token, deforestation related to the planting of oil palms can also be explained by the cost-effective price of palm oil compared to other oils for food use (margarine, biscuit, spreads, etc.) and in the composition of non-foods such as soap and cosmetics.

EU BIOFUEL CONSUMPTION RISES BY 9.2%

While roadmap for biofuel is now clearly defined, the current consumption level and confirmation of the 7% cap for biofuels produced from food crops, open new outlets for biofuel use. EurObserv'ER reports that biofuel consumption edged upwards in 2016, then surged in 2017 (see tables 2 and 3). If we consider energy content as opposed to volume (as energy density varies by type of biofuel), overall biofuel consumption rose over the 12 months by 9.2% to 15 514 ktoe. This estimate is based on the responses to questionnaires sent to the various ministries and statistical offices tasked with renewable energy accounting and in their absence is based on Eurostat's provisional estimates published in June 2018 (sources quoted at the end of this barometer).

According to EurObserv'ER, biofuel consumption in the European Union reached 15.5 Mtoe in 2017, which is a rise of 1.3 Mtoe over the previous year. Consumption of all the major biofuel categories increased but of the top two, it is biodiesel (including HVO synthetic biodiesel) which increased faster, gaining 1 142 ktoe (10%) on its 2016 level. At the same time, bioethanol consumption only increased by 156.6 ktoe (5.8%). Accounting of biogas fuel consumption for NGV (Natural Gas Vehicle) motorisations was conducted in three countries – Sweden, Finland and Germany. This consumption also increased by 9.7% rising from 134.5 ktoe in 2016 to 147.5 ktoe in 2017. Biodiesel has the highest consumption of all biofuels in Europe, as shown in graph no. 2.

The EurObserv'ER survey also examined sustainably-certified biofuel consumption, based on the criteria set by the European renewable energy directive. We remind you that only certified fuels are eligible for inclusion in the national target figures. Preliminary estimates suggest that Member State-certified consumption would be slightly less than 15.5 Mtoe, which means that almost all

Tabl. n° 1

Biofuels consumption for transport in 2016 and 2017 for main non UE trading partners (in toe)

Pays	2016		2017	
	Bioethanol	Biodiesel	Bioethanol	Biodiesel
USA	27 483 752	6 260 506	28 933 110	5 870 163
Brazil	13 234 917	3 010 563	12 912 139	3 408 275
China	1 790 687	348 592	1 992 739	285 211
Canada	1 436 085	190 141	1 518 421	198 063
Japan	382 889	9 507	449 566	9 507
Norway*	31 360	317 700	32 516	473 324
Turkey*	46 080	56 700	49 920	60 300

** Data were expressed in tons and have been converted with the following coeficient : 1 ton of bioethanol = 0,64 toe and 1 ton of biodiesel =0,86 toe.*
Sources : Eurostat, USDA Foreign Agricultural Service, U.S. department of energy, EIA

Tabl. n° 2

Biofuels consumption for transport in the European Union in 2016 (in toe)

Country	Bioethanol	Biodiesel*	Biogas fuel	Total consumption	% certified sustainable
France	474 000	2 641 000	0	3 115 000	100.0%
Germany**	745 199	1 796 121	33 438	2 574 759	98.9%
Sweden	109 057	1 245 987	98 882	1 453 927	100.0%
Spain	135 493	980 656	0	1 116 150	98.4%
Italy	32 500	1 008 300	0	1 040 800	100.0%
United Kingdom	388 865	556 750	0	945 615	100.0%
Austria	52 809	606 286	334	659 430	99.9%
Poland	167 700	289 700	0	457 400	100.0%
Belgium	40 628	390 609	0	431 236	100.0%
Czech Republic	55 341	228 790	0	284 131	100.0%
Portugal	20 388	256 237	0	276 625	100.0%
Romania	81 300	175 900	0	257 200	100.0%
Netherlands	120 593	118 921	0	239 515	96.9%
Denmark	44 000	173 000	0	217 000	100.0%
Hungary	43 800	143 300	0	187 100	126.7%
Finland	71 845	108 651	1 839	182 335	98.2%
Bulgaria	32 900	130 200	0	163 100	100.0%
Greece	0	149 000	0	149 000	32.9%
Slovakia	15 500	124 500	0	140 000	100.0%
Ireland	33 380	85 116	0	118 495	100.0%
Luxembourg	8 813	79 249	0	88 062	100.0%
Lithuania	6 425	50 086	0	56 511	100.0%
Slovenia	4 300	14 100	0	18 400	100.0%
Latvia	8 300	4 400	0	12 700	100.0%
Cyprus	0	8 718	0	8 718	100.0%
Malta	0	6 300	0	6 300	100.0%
Estonia	2 600	0	0	2 600	100.0%
Croatia	0	900	0	900	100.0%
Total EU 28	2 695 736	11 372 778	134 494	14 203 009	99.2%

** HVO biodiesel figure included ** Germany consumption figures include consumption of 2 388 toe of pure vegetable oil.*
Source : EurObserv'ER 2018.

the EU's biofuel consumption intended for transport now complies with the European Commission's sustainability requirements.
Incidentally, the EU is not the world's top biofuel consumer. Table no. 1 shows that the American continent leads by a long shot, primarily with Brazil (at 16.3 Mtoe in 2017) and the USA which alone consumes more than twice as much as the EU (34.8 Mtoe in 2017).

French biofuel consumption is the highest in the EU

The Ministry for Ecological and Inclusive Transition's Statistics Office reports that biofuel consumption reached 3 335 ktoe in 2017, which is a year-on-year increase of 7.1%. Total consumption breaks down as follows: 539 ktoe of bioethanol to 2 796 ktoe of biodiesel, with a 155-ktoe increase (5.9%) over 2016 for the biodiesel sector and a 65-ktoe increase (13.7%) for the bioethanol sector. Consumption of synthetic biodiesel (HVO) has enjoyed the strongest growth over the past few years, rising in volume from 2 368 tonnes in 2013 to 295 042 tonnes in 2017 (it increased by 93 973 tonnes between 2016 and 2017). It now accounts for 9.5% of France's biodiesel consumption by volume. After 3 years of stability between 2014 and 2016

Tabl. n° 3

Biofuels consumption for transport in the European Union in 2017 (in toe)*

Country	Bioethanol	Biodiesel***	Biogas fuel	Total consumption	% certified sustainable
France	539 000	2 796 000	0	3 335 000	100.0%
Germany**	730 868	1 843 890	33 438	2 608 197	99.0%
Sweden	104 185	1 431 141	111 111	1 646 436	100.0%
Spain	139 597	1 148 074	0	1 287 672	99.0%
Italy	32 890	1 027 458	0	1 060 348	100.0%
United Kingdom	385 791	548 100	0	933 891	100.0%
Austria	53 860	618 420	358	672 638	99.9%
Poland	159 583	421 514	0	581 097	100.0%
Belgium	90 284	374 702	0	464 985	100.0%
Finland	87 059	303 764	2 603	393 427	99.3%
Czech Republic	75 141	244 077	0	319 218	100.0%
Netherlands	128 953	174 143	0	303 095	98.2%
Hungary	64 058	199 317	0	263 375	100.0%
Romania****	81 300	175 900	0	257 200	100.0%
Portugal	2 924	252 172	0	255 096	100.0%
Denmark	44 000	173 000	0	217 000	100.0%
Bulgaria	38 690	156 722	0	195 413	100.0%
Slovakia	39 338	136 094	0	175 432	100.0%
Ireland	30 168	130 104	0	160 272	100.0%
Greece	0	151 000	0	151 000	100.0%
Luxembourg	6 688	104 686	0	111 374	100.0%
Lithuania	7 356	53 597	0	60 953	91.5%
Slovenia	0	35 161	0	35 161	100.0%
Latvia	7 971	2 895	0	10 866	100.0%
Cyprus	0	8 570	0	8 570	100.0%
Malta	0	3 988	0	3 988	100.0%
Estonia****	2 600	0	0	2 600	100.0%
Croatia	0	324	0	324	100.0%
Total EU 28	**2 852 305**	**12 514 812**	**147 511**	**15 514 629**	**99.7%**

** Estimate. ** Germany consumption figures include consumption of 2 388 toe of pure vegetable oil. *** HVO biodiesel figure included **** As consumption data for Romania and Estonia were not available at the time of EurObserv'ER's data collection, data from 2016 was used.* ***Source: EurObserv'ER 2018.***

Bioethanol plant in Crescentino, Italy

(of about 2.6 million tonnes), consumption of VOME (vegetable oil methyl ester) biodiesel finally rose by 53 300 tonnes in 2017. Bioethanol consumption, which in energy content reached 539 ktoe in 2017, accounts for 783 098 tonnes in volume terms (695 694 tonnes in 2016). It includes a proportion of bioethanol consumed as ETBE (ethyl tert-butyl ether – a blend of bioethanol with an oil industry sub-product) and a small proportion of synthetic biopetrol (obtained by hydrotreatment of oils or by the Fischer-Tropsch process from a synthetic gas) whose consumption volume reached 84 735 tonnes in 2017 (62 414 tonnes in 2016).

France has committed to a biofuel development programme and has implemented a raft of measures to encourage their production and market launching. The plan has set ambitious biofuel incorporation targets for traditional fossil fuels. Article 32 of the 2005 Finance Bill introduced a tax (TGAP) on the release for consumption of petrol and diesel based on the sales price before VAT. It encourages the incorporation and distribution of biofuel by penalising operators who supply less biofuel for consumption than the incorporation target set for each sector. These targets (energy proportion) for 2017 are 7.5% for bioethanol (including a double accounting maximum of 0.3%) and 7.7% for biodiesel (including a double accounting maximum of 0.35%). Article 43 of the Energy Transition Law for Green Growth places priority on developing advanced biofuel while safeguarding past investments made in the conventional biofuel production sectors. The following targets were set for advanced biofuel incorporation in the Multiannual Energy Programme adopted by Decree 2016-1442 on 27 October 2016. For 2018, they are 1.6% for the petrol sector and 1% for the diesel sector. They will rise to 3.4% for the petrol sector and to 2.3% for the diesel sector in 2023.

Consumption stable in Germany

By and large, Germany's biofuel consumption has been stable over the past three years. According to AGEE-Stat, the Working Group on Renewable Energy – Statistics, biofuel consumption increased very slightly in 2017, rising to 2 608.2 ktoe from 2 574.8 ktoe in 2016. Biodiesel's contribution must take the credit for this increase (of 47.8 ktoe), since bioethanol consumption slipped slightly (by 14.3 ktoe). Biomethane sales (biogas fuel) for transport are similar to those of 2016. If we include renewable electricity consumption in electric vehicles, the renewable energy share used in transport remained stable at 5.2% in 2017 (5.2% in 2016 and 5.3% in 2015). This figure is much lower than its 2007 level of 7.5% and results from the implementation of the new system based on a GHG emissions reduction quota for diesel and petroleum fuels, which indirectly stimulates biofuel use.

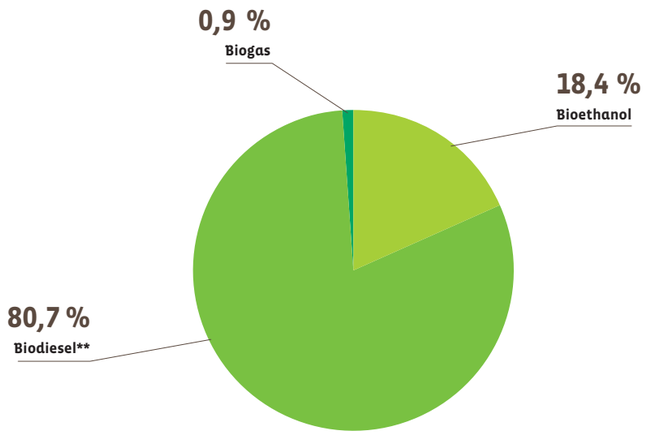
The HVO process

This hydrogenation process was patented and developed by the Finnish oil company, Neste Oil. It is a catalytic reaction like the traditional process. However, in the HVO process the catalyst used is hydrogen rather than methanol, which is used in the other types of biodiesel. The advantages of this technology are that it avoids the coproduction of glycerine, which cannot always be used by local outlets. HVO can use waste oil as a feedstock. The technique also removes oxygen atoms, resulting in a more stable final product. Lastly, the reaction's products are essentially alkanes, which obtain higher cetane indexes than the other types of biodiesel. The final product, which is an HVO synthetic biodiesel, is very similar to fossil diesel. Its production cost is slightly higher than that of traditional biodiesel, but the product obtained is of much better quality and can be used unblended in a traditional diesel engine.

Synthetic biopetrol can be obtained by hydrotreatment of oils or by using the Fischer-Tropsch process from a synthetic gas. Synthetic biopetrol is totally miscible with petrol and can be incorporated up to a few percent for use in traditional petrol-driven engines.

Graph. n° 2

Breakdown of total EU 2017 biofuel consumption in energetic content for transport by biofuel type.*



** Estimate ** Consumption of pure vegetable oil included in the biodiesel figure.* ***Source: EurObserv'ER 2018.***

Since the 2015 enactment of the Federal Emission Control Act (Bundes-Immissionsschutzgesetz), the oil industry has been forced to reduce its fuel emissions (the emission reduction percentage of the total quantity of fuel used compared to the hypothetical GHG emissions of 100% fossil fuel). The emission reduction percentage laid out in the Emission Control Act are 3.5 from 2015 on and rise to 4.0 % from **2017** and will rise again to 6.0% from 2020 onwards.

The system is designed to encourage the incorporation of those types of biofuel that emit the least CO_2. Now, producers who launch their certified biodiesel and bioethanol on the market must indicate the amount of GHG emissions saved by using these fuels. Thus, to be more attractive, it is in the biofuel producers' interest to improve their industrial processes to enhance GHG efficiency. The downside is that as biofuel production methods improve their performance by reducing GHG, the biofuel incorporation volume drops for the fuel suppliers. In other words, the improvement in the environmental quality of biofuels effectively limits the volume to be incorporated. Thus, the oil suppliers have everything to gain by incorporating biofuel with the lowest possible CO_2 emission level to maximise their petroleum fuel sales.

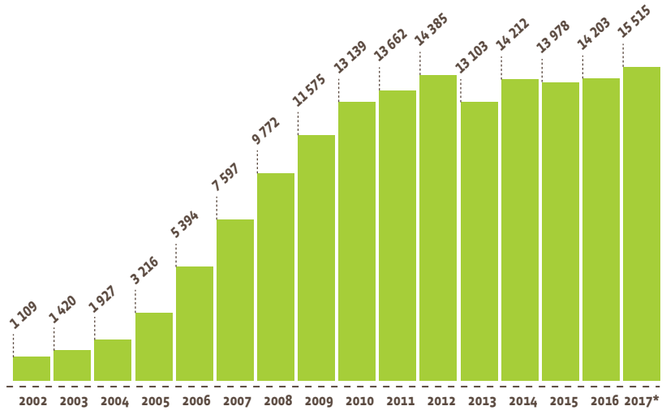
Advanced biofuels and bioliquids

The term "advanced biofuel" broadly covers the production of biofuels known as second-generation biofuels (thermochemically or biochemically produced from lignocellulosic biomass feedstock) and third-generation biofuels produced by photosynthesis from micro-organisms (microalgae) from CO2 and light, or by fermentation of various organic substrates (yeasts, bacteria, microalgae). They also include biofuels produced from waste cooking oils or animal fats.

These types of biofuel enable considerable reductions in GHG emissions to be made while posing a low risk of inducing indirect land use changes. Moreover, they do not compete directly with crops intended for human or animal nutrition. The applicable feedstocks are listed in appendix IX, parts A and B of the ILUC directive. They include: straw, inedible cellulosic matter, forestry waste or sub-products from the timber sector (bark, sawdust, black liquor, and so on), waste cooking oils, specific animal fats, algae and bacteria.

Graph. n° 1

Trend in biofuel (liquid and biogas) consumption for transport in the European Union (EU 28) in ktoe



** Estimate.*

Sources : Data from 2002 to 2015 (Eurostat 2018), data for 2016 to 2017 (EurObserv'ER 2018 - see methodological note).

Biofuel consumption in Sweden enjoys a new record year

Preliminary data released by Statistics Sweden and the Swedish Energy Agency shows that in 2017 biofuel accounted for 20.8% of all the fuel used in Swedish vehicles, which is far and away the highest incorporation rate in the European Union. Taking all biofuels together, consumption reached 1 646.4 ktoe in 2017, which is 13.2% more than in 2016. The increase can be basically ascribed to the high growth (by 149%) of biodiesel to 1 431.1 ktoe, and in particular of HVO biodiesel. Another reason for the increase is the growth in biogas fuel consumption (by 12.4%), which overtook bioethanol consumption for the first time. The latter saw its consumption slide from 109.1 to 104.2 ktoe. According to SVEBIO (the Swedish Bioenergy Association), the reason for the surge in Sweden's biofuel consumption is the sharp growth in the use of HVO biodiesel, primarily in the form of pure HVO100. The consumption volume data released for FAME biodiesel came to 330 847 m³ (including 70 820 m³ of B100, a 100% biodiesel fuel) while that of HVO biodiesel came to 1 441 780 m³ (including 564 887 m³ of HVO100).

The Swedish government aims to make vehicles independent of fossil fuels by 2030. Hybrid vehicles that can run 100% in electric mode are also included in the target. Non-fossil fuel "environmentally-friendly" vehicles are promoted by total or partial energy tax exemption, depending on the type of biofuel and proportional blend. Tax exemption is 100% for biofuel used unblended from 2018 through to 2020. New legislation has introduced GHG reduction targets for fuel suppliers from 1 July 2018 onwards. The annual reduction

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Methodology note

In a departure from the method used in previous biofuel barometers, EurObserv'ER asked the national experts to convert the biofuel volumes intended for transport (expressed in tonnes) into energy units using the criteria defined by the European Renewable Energies Directive instead of making the calculations itself. The reason for this change in methodology is that synthetic biofuel consumption has taken an increasing share, primarily in the case of HVO biodiesel (produced from hydrogenated vegetable oil) whose energy content at identical volume is much higher than "classic" FAME biodiesel (Fatty Acid Methyl Ester). The rules surrounding statistical secrecy do not always result in an exact breakdown of the different types of biodiesel (synthetic HVO and FAME biodiesel) in the total consumption of the Member States. This makes it hard for EurObserv'ER to use the specific conversion criteria for each type of biofuel defined by the Directive.

quotas differ for diesel and petrol. The initial annual reduction levels for petrol were set at 2.6% and at 19.3% for diesel. The government has announced further reductions from 1 January 2019 onwards of 2.6% for petrol and 20% for diesel, and from 1 January 2020 onwards, of 4.2% for petrol and 21% for diesel.

Spain's consumption rises by 15.4%

Spanish biofuel consumption has increased sharply. Data released by IDAE, the Institute for Diversification and Energy Saving, shows that in 2017 it reached 1 287.7 ktoe, which represents a 15.4% year-on-year rise. Most of the increase was provided by 17.1% growth in biodiesel use to reach 1 148.1 ktoe in 2017 (annual growth of 167.4 ktoe). Bioethanol consumption only grew by 3% to 139.6 ktoe (an increase of 4.1 ktoe).

The increase can be ascribed to the rise in the obligatory rate of energy content the distributors have to incorporate into fuel from 4.3% in 2016 to 5% in 2017. The 5% level applies to all biofuels as the Spanish government decided against defining separate incorporation targets for biodiesel and bioethanol, and this dates back to enactment of Royal Decree 1085/2015. Biofuel use should continue to rise, and the energy content incorporation rate should gradually increase to 6% in 2018, then to 7% in 2019 and 8.5% in 2020. However, growth will not be in proportion to the current consumption level because Spain plans to introduce double accounting for advanced biofuels, which should curb growth in biofuels produced using conventional feedstocks.

INDUSTRY COMMITS TO PRODUCING ADVANCED BIOFUELS

The production of first-generation bioethanol and biodiesel

According to the provisional Eurostat figures collected by EurObserv'ER, European bioethanol output rose to 3 875 463 tonnes in 2017 (around 2 480 ktoe)... an 11% increase over 2016. Production capacities are tending to dip slightly, and this started in 2016, when there were 55 first-generation bioethanol refineries compared to 60 in 2015 according to the USDA Foreign Agricultural Service annual report. The number of 55 units was stable through to 2018, yet production capacity in litres slipped from 8 180 million in 2016 to the current 7 920 million litres. This

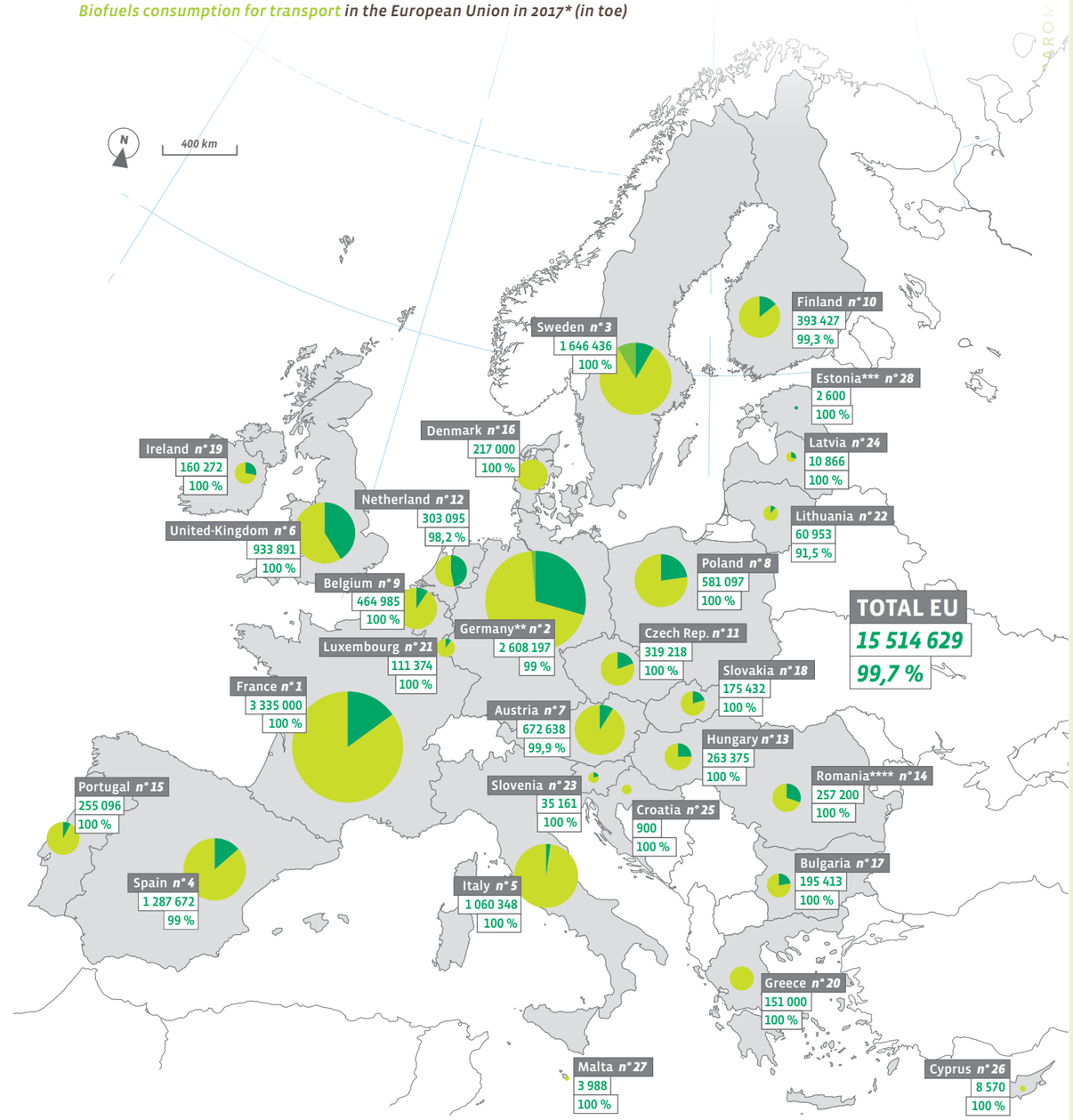
Tabl. n° 4

Production capacity of the main European bioethanol producers in Europe in 2017 (in millions of litres)

Company	Country	Number and location of plants in Europe	Bioethanol production capacity (in million liters)	Raw materials
Crop Energies	Germany	Germany, Belgium, France, UK	1 300	Sugar juice, wheat, maize, triticale
Tereos*	France	France, Czech Republic, UK, Italy	1 260	Sugar juice, wheat
Cristanol	France	France	380**	Sugar juice, wheat
Vivergo	United Kingdom	UK	420	Wheat
Agrana***	Austria	Austria	250	Wheat, maize

** Data from 2015. Altthough production decreased, no plants have been sold or dismantled. The production capacity would remain unchanged. ** Bioethanol production. Production capacity may be different. *** Agrana owns 50% of a joint-venture : Ungrana - Bioeconomy Company, based in Hungaria. This JV also produces bioethanol but its production capacity is not indicated. No ethanol plant in Europe is using sugar beet directly. What is processed is sugar juice also often known as syrup or molasses.* ***Source: EurObserv'ER 2018.***

Biofuels consumption for transport in the European Union in 2017 (in toe)*



Key

Country
331 *Biofuel consumption for transport (toe)*
100% *% certified sustainable*

Bioethanol *Biodiesel*** *Biogas*

** Estimate. ** Germany consumption figures include consumption of 2 388 toe of pure vegetable oil. *** HVO biodiesel figure included. **** As consumption data for Romania and Estonia were not available at the time of EurObserv'ER's data collection, data from 2016 was used.* ***Source: EurObserv'ER 2018.***

Tereos production unit located in Origny-Ste Benoite, France

Tabl. n° 5

Production capacity of the main biodiesel producers in 2017 (in tons)

Company	Country	Number and location of plants in Europe	Production capacity in 2017
Neste Oil	Finland	Finland, Netherlands	2 600 000
Avril	France	France, Germany, Italy, Austria, Belgium	1 800 000*
Infinita	Spain	Spain	900 000
Marseglia Group (Ital Green oil and Ital Bi Oil)	Italy	Italy	560 000
Verbio AG	Germany	Germany	470 000
Eni	Italy	Italy	360 000
Total**	France	France	500 000

Production and not capacity, which may be higher **Capacity as planned for the end of 2018.* ***Source : EurObserv'ER 2018.*

phenomenon can be put down to sector restructuring essentially geared to the capacity utilisation rate. This rate has risen from 71% in 2016, to about 79% for 2018. As for fuel prices, the price of bioethanol has dropped. This trend, which continued through the first quarter of 2018 reduced the sector companies' sales figures, despite the lower cost of feedstocks, primarily wheat and maize, which in 2017 had tended to increase the bioethanol producers' profit margins. For example, Crop Energies, a German business, saw its earnings fall by 17% between the first quarter of 2017 and the first quarter of 2018 (from 231 to 192 million euros). The EU still has major companies working in this sector, whose core business is sugar, as shown in table no. 4.

The European Union is still the leading biodiesel producer worldwide with 13 317 923 tonnes in 2017 (around 11 453 ktoe), and large representative corporations (see table no. 5). However, the notion of biodiesel should be in the plural because there are actually two competing technologies. Firstly, the FAME biodiesel sector (FAME = Fatty Acid Methyl Ester) whose producers hail from farming and secondly the HVO biodiesel sector (HVO = Hydrogenated Vegetable Oil) whose producers hail from the oil and refinery businesses. The latter is the most recent. It now operates on an industrial scale in six European countries and is taking up the benefit of more sustained growth momentum.
Despite an increase in biodiesel consumption in 2017, the European FAME sector has seen little of the action because it has had to face off competition from HVO imported from Argentina and Indonesia. A point in case is the French group Avril, which had to implement an emergency plan to reduce the biodiesel output of its subsidiary, Saipol. It blames the situation on the "threat of Argentine biodiesel" whose import cost fell as soon the anti-dumping measures levelled at it had been lifted. The FAME sector players are up in arms against three years of deteriorating market conditions. In the meantime, HVO output continues to rise. The HVO sector produced 2 583 million litres in 2017 and its production capacities are reported to be increasing.

Deployment of advanced biofuels

Many European firms are ready to support the European 3.5% advanced biofuel incorporation target by 2030. The USDA Foreign Agricultural Service puts the 2017 output of the six advanced HVO refineries in service at 2.6 billion litres. Advanced HVO is produced from waste oil and fats. This output could rise to 2.8 billion litres in 2018 and to 4 billion litres in 2020 with at least eight refineries operating as new French and Italian plants start up.
The Italian group, Eni, is currently converting its Gela refinery, in Sicily. It should eventually produce 680 million litres per annum. Conversion work started in April 2016 and the refinery should come on stream at the end of 2018. The firm opened an HVO site in Venice in 2014, with 325 million litres of capacity that could also be extended to 540 million litres in 2020. The Finnish company Neste Oil, the originator of HVO diesel, has two sites with a capacity of 215 million litres in Finland and one in Rotterdam with 1 280 million litres of capacity. Grease and waste oil accounts for 76% of the feedstock used, while the remainder is cooking oil or animal fats. In France, the Total group has built a unit at La Mède (in the Bouches du Rhône) designed to produce up to 200 million litres when it opens at the end of 2018. Its capacities could rise to 640 million litres in the future. Vegetable mainly palm oil should provide 60–75% of the feedstock. The rest (25–40%) should take the form of waste cooking oil and animal fat. The project has caused an outcry among French rapeseed farmers

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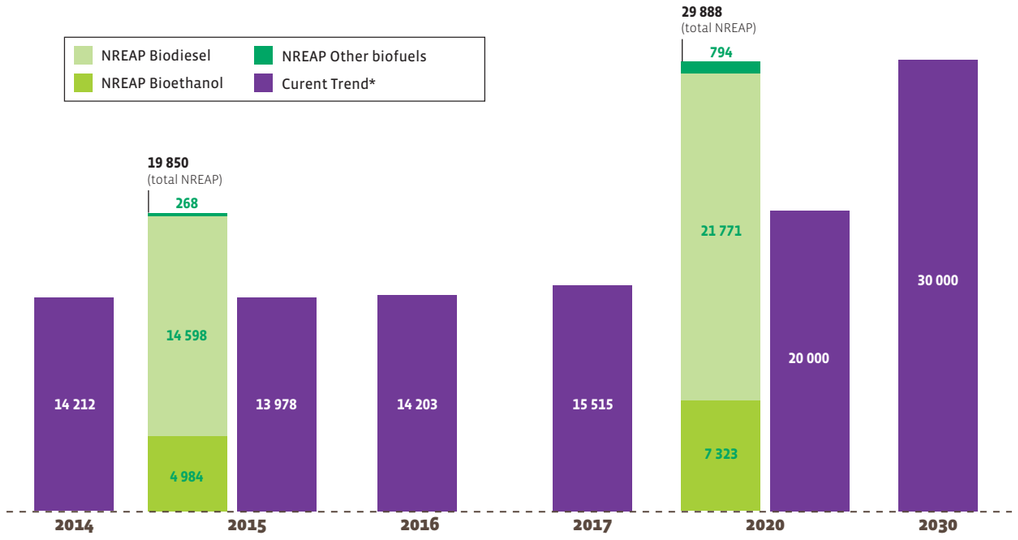
who view the use of imported South-East Asian palm oil as being in competition with their own production, especially as its environmental impacts are highly criticized (see insert on the ILUC effect).
Another sector said to be of advanced – cellulosic bioethanol – biofuel is struggling to take off. Its total European capacity is 60 million litres. Deployment of this technology is held back by research and development costs and regulatory uncertainties, causing a few European production centres to close down. In Italy, the Beta Renewables site closed at the end of 2017, having started production in 2013 with production capacity of up to 50 million litres. However, the sector has not totally ground to a halt. In 2018, a 10 million litre capacity site went on stream in Finland and could be producing 50 million litres by 2020. Its feedstock will include wood waste. The site is managed by the St1 Biofuels Oy group, in conjunction with North European Tech Oy. Other centres are opening in countries prompted by the impetus given by REDII, having previously had little involvement in biofuel production. For example, the Swiss company Clariant is constructing a 50 000 tonne capacity cellulosic ethanol biofuel production site in Romania, that will use cereal residue feedstock supplied by the local farmers.

CONSUMPTION COULD BE ON TRACK TO DOUBLE BY 2030

Conventional and advanced bioethanol and biodiesel consumption will continue to increase across the European Union, driven by the increase in incorporation rates planned by each Member State. These targets are set either as energy content or volume of incorporation, with or without specific targets for bioethanol and biodiesel. Most of the Member States have adopted double accounting for advanced biofuels as authorized by the European Directive (namely, the possibility of allocating a multiplying factor of 2 to consumptions of this type of biofuel when computing the renewable energy target for transport), thereby reducing the real incorporation level. Examples of country biofuel incorporation rates by energy content for 2020 are 8.5% for Spain, 8.5% for Poland, 8.75% for Austria, 8.81% for Croatia, 10% for Greece, 10% for Italy, 10% for the Netherlands, 10% for Portugal and 20% for Finland.
According to the annual GAIN report data published by the USDA Foreign Agricultural Service, the incorporation rate in energy content excluding double accounting could rise to 5.2% in 2018, breaking down as 3.6% for bioethanol and 5.8% for biodiesel. The share of biofuels produced from food crops is put at 4.1%, to be viewed against the 7% cap introduced under the terms of the ILUC Directive for the 2020 timeline and in the longer term under the terms of RED II from 2021 to 2030. The theoretical room for improvement for conventional biofuels is thus 2.9 percentage points by 2020. The share in blends and energy content of advanced biofuels (not produced from food crops) is put at 1.2%, of which 1% is produced from waste cooking oil or animal fat (listed in Part B of appendix 9 of the renewable energy directive) and 0.2% from farming and forestry sub-products, primarily derived from cellulosic feedstock (listed in part A of the same appendix).
The report's authors ventured into forecasting. Taking into consideration the EU's historical fuel consumption records and the European Commission's projections for fuel use in transport (taken from its EU Reference Scenario 2016 Energy, transport and GHG emissions Trends to 2050 publication) and combining them with the 7% cap, the maximum potential biofuel consumption produced from food crops could theoretically reach 23 Mtoe in 2022 then drop to 21 Mtoe in 2030. These figures are theoretical and prone to downsizing through the policies of the various Member States. They also depend on the allocation made by the various states to the other energy sources to reach the binding 14% share of renewable energy in transport, combined with other multiplying factors. The proposed multiplying factors are 4 for renewable energies used in electric vehicles, 1.5 for rail transport, 1.2 for biofuels used in air and maritime transport and 2 for advanced biofuels (Parts A and B). The RED II targets for advanced biofuels from part A of the appendix (cellulosic biofuel) are 0.2% in 2020, i.e. the same as the current level. However, this share should rise to 3.5% by 2030, which will take this consumption level to just over 10 Mtoe. To achieve this level, a hundred or more cellulosic biofuel production units will have to be constructed, each with a capacity of 200 000 litres. Advanced biofuel consumption produced from the feedstocks listed in part B (used vegetable oil and animal fat) could rise to just over 5 Mtoe by 2022 and settle at 5 Mtoe by 2030.

Graph. n°3

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



** Consumption of certified and not certified biofuels. Projection for 2020 does not include the biofuel consumption of the UK.* ***Source: EurObserv'ER 2018.***

Maximum theoretical biofuel output (all types combined) could rise to 35 Mtoe by 2030, which is more than twice the consumption measured in 2017. The experts from EurObserv'ER forecast a biofuel consumption for transport no higher than 30 Mtoe (see graph no. 3).
These projections are largely theoretical, because while intentions are positive, the targets set under the terms of RED II will not be binding for each Member State in practice. The European Commission will have the right to check and verify that the Member States are sticking to their commitments, so that taken together, they will achieve the common target across the European Union. □

Sources used: AGEE-Stat (Germany), DEA (Denmark), Ministry of Environment and Energy (Greece), Ministry of Industry and Trade (Czech Republic), SDES (France), Statistics Netherlands, DGEG (Portugal), University of Miskolc (Hungary), SEAI (Ireland Rep.), Statistics Austria, DBEIS (United Kingdom), IDAE (Spain), Ministry of Energy, Commerce, Industry and Tourism (Cyprus), Statistics Lithuania, Statistics Finland, Finnish biogas association, Swedish Energy Agency, FOD Economie (Belgium), IEA biofuel survey (Belgium), STATEC (Luxembourg), Eurostat's project on Early estimates of energy balances.

The next barometer will cover heat pumps technology

This project is funded
by the European Union under
contract nº ENER/C2/2016-487/SI2.742173

BIOFUELS BAROMETER – **EUROBSERV'ER** – SEPTEMBER 2018