



Industrial wood chips storage plant, Germany.



+1.7%

The growth, gross inland consumption from solid biomass in the EU between 2016 and 2017

SOLID BIOMASS BAROMETER

A study carried out by EurObserv'ER.



Solid biomass energy consumption trends are at the mercy of public policies encouraging its use, but when we look at the heating application, it also correlates to outdoor temperatures, which were fairly mild in 2017. According to the World Meteorological Organization it was the 5th hottest year ever recorded in Europe, which restrained its increase in heating requirements. According to EurObserv'ER, solid biomass heat consumption increased by 1.1 Mtoe in 2017, which is 1.4% more than in 2016, for a total of 79.9 Mtoe. Growth in electricity recovery from solid biomass was stronger in 2017 (2.9%) reaching 94.5 TWh, driven by coal-fired power plant conversions in the UK, Finland and Denmark.

94.5 TWh

The electricity production from solid biomass in the EU in 2017

79.9 Mtoe

The heat consumption from solid biomass in the EU in 2017



Biomass domes at Drax Power Station

Solid biomass is an umbrella term for all solid organic components to be used as fuels. They include wood, timber industry by products (wood chips, sawdust, etc.), wood pellets, black liquor from the paper industry, straw, bagasse, animal waste and other solid plant residues. Energy recovery from solid biomass is mainly used to produce heat and electricity. While lignocellulosic biomass (cereal straw, forest waste, etc.) can also be converted into 2nd generation liquid biofuel or gas, such as hydrogen or methane, these recovery methods are still marginal across the European Union.

PRIMARY ENERGY CONSUMPTION APPROACHES THE 100 MTOE THRESHOLD

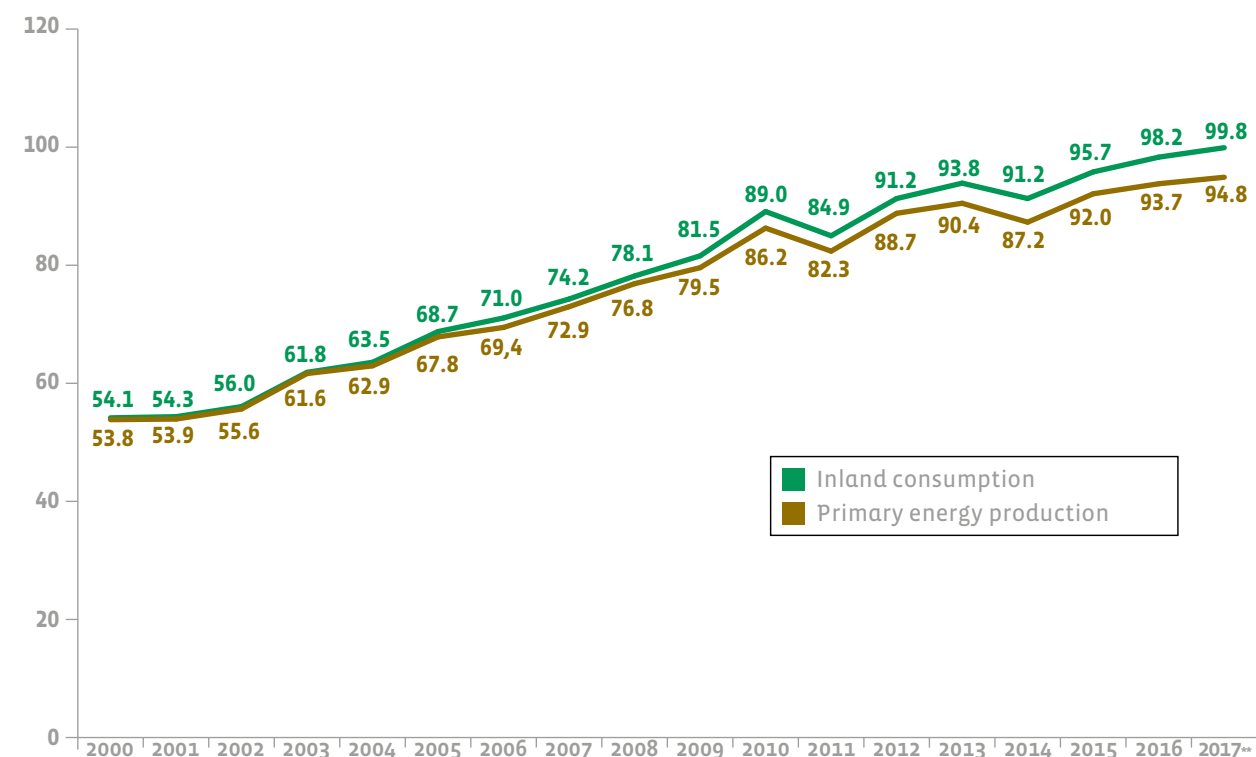
EurObserv'ER bases its figures on the official data available at the beginning of December. It puts primary energy consumption from solid biomass at just below the 100 Mtoe threshold in 2017. As shown in **table 1 and graph 1**, consumption grew by 1.7% to reach 99.8 Mtoe, which equates to a 1.6 Mtoe increase. The individual member states present a mixed picture, as a few of them saw their solid biomass consumption contract slightly. They include Poland (by 279 ktoe), France, including the Overseas Territories (218 ktoe) and Hungary (117 ktoe). In contrast, the most signifi-

cant increases can be assigned to Italy (521 ktoe), the UK (423 ktoe), Denmark (401 ktoe) and Finland (285 ktoe). Primary energy production from solid biomass, exclusively sourced from European Union soil, increased at a slightly slower pace (1.2%) totalling 94.8 Mtoe (a 1.1 Mtoe increase between 2016 and 2017). Most of the difference, equating to net imports, can be put down to wood pellet imports from the USA and Canada (see further on). Over the last three years, the EU balance of net imports has been rising. It stood at 3.7 Mtoe in 2015, 4.5 Mtoe in 2016 and 5 Mtoe in 2017. EurObserv'ER differentiates the two types of final energy use from solid biomass, namely electricity and heat (for space heating or process heat) in **tables 2, 3 and 4**. Solid biomass heat is further broken down depending on whether it is used directly by the end consumer (in the residential or industrial sectors) or comes from the conversion sector, i.e. distributed via heating networks. Despite an abnormally cold January in much of Europe, and particularly in the centre and south-east that experienced record lows, solid biomass consumption for heating only increased slightly across the European Union. In the countries that lie further west, the cold snap was offset in the following months by a significant thaw and a relatively mild end to 2017. However, countries

such as Italy endured bitter cold at the start of the year, which drove household solid biomass consumption upwards. Solid biomass heat consumption trends were also affected by the access to heat – distribution through heating networks or direct consumption by the residential and industrial sectors. EurObserv'ER reckons that the amount of heat directly used by final consumers across the EU increased very little in 2017 (by 1% over its 2016 level) to a total of 69.1 Mtoe in 2017. Gross solid biomass heat sold to heating networks increased faster (by 4.1%) to 10.9 Mtoe, in line with the proactive biomass cogeneration policies of Finland, Denmark and Sweden in particular. Of this total, about 60% of the heat sold (6.6 Mtoe in 2017) was produced by cogeneration plants. In northern Europe, recourse to heating networks is more highly developed. The three Nordic countries, Sweden, Finland and Denmark account for more than half the European Union total (51.3% in 2017). If we add together the heat sold by heating networks to its direct use by households and industry, total solid biomass heat consumption, increased by about 1.1 Mtoe in 2017 to 79.9 Mtoe. European Union production of solid biomass electricity is less vulnerable to the vagaries of climate. It depends more on the policies of the few member states that promote its use instead of coal. Across the European Union, bio-

Graph. n° 1

Solid biomass primary energy production and inland consumption* growth figures for the EU since 2000 (in Mtoe)



*Excluding charcoal. **Estimate. Sources: years 2000-2014 Eurostat, years 2015, 2016 and 2017 EurObserv'ER.

mass electricity production increased by 2.9% year-on-year to 94.5 TWh in 2017 (adding 2.7 TWh). Most of this figure can be attributed to the growth in solid biomass' net maximum electrical capacity in the major producer countries. Electrical capacity in the UK, reached 3 191 MW at the end of 2017 (196 MW more than in 2016), that of Finland 1 966 MW (219 MW more) and Denmark 1 504 MW (472.6 MW more). Higher output in the other countries can be ascribed to better use of existing capacities. Examples of this are Sweden and Belgium whose solid biomass electrical capacities at the end of 2017 were 3 706 MW and 559 MW respectively. Four countries stand out as the clear leaders in the solid biomass electricity producer country rankings – the UK (20.8 TWh in 2017, 1.2 TWh more than in 2016), Sweden (10.3 TWh, 0.5 TWh more), Finland (10.9 TWh, 0.3 TWh more), and Germany (10.7 TWh, 0.1 TWh less). Taken together, the four account for 55.7% of the European Union's solid biomass electricity output in 2017. Across the European Union (EU of 28), cogene-

ration plants produce more than half (58.5% in 2017) of its solid biomass electricity. If we exclude the UK, the proportion is 74.9%.

DOUBLE-DIGIT GROWTH FOR EU WOOD PELLET CONSUMPTION

According to EPC (European Pellet Club) data published in the 2018 Bioenergy Europe statistical report, wood pellet consumption in the EU of 28 shot up in 2017, enjoying double-digit growth (10.5%). Consumption increased from 21.8 million tonnes in 2016 to 24.1 million tonnes (Mt), all uses taken together. Wood pellet consumption rose from 9 to 9.7 Mt (8.2%) in the residential sector, from 2.9 to 3.4 Mt (15.9% growth), in the commercial sector, from 2.4 to 2.9 Mt in cogeneration plants and from 7.5 to 8.1 Mt in other power plants. This consumption equates to 40.4% for the residential sector (41.2% in 2016), compared to 14% for the commercial sector (13.3% in 2016),

12.2% in CHP plants (11% in 2016) and 33.5% in non-CHP power plants (34.5% in 2016). If we consider that two-thirds of the wood pellets used in CHP plants produced heat, the total used for heating purposes (residential, commercial, 2/3 CHP) was 15.1 Mt in 2017 (13.5 Mt in 2016), i.e. 62.5% of total EU wood pellet consumption (61.9% in 2016).

The UK remains the EU's biggest wood pellet consumer at 7.5 Mt, ahead of Italy (3.5 Mt), Denmark (3.3 Mt), Germany (2.1 Mt), France (1.6 Mt), Sweden (1.5 Mt), Belgium (1.4 Mt), Austria (1 Mt), Spain (0.5 Mt), Finland (0.35 Mt) and Poland (0.34 Mt). The main uses for wood pellets vary wildly between countries. The UK and Belgium essentially use them to fuel power plants (91% and 74.5% respectively), while the main use in Denmark (61.2%) and Sweden (39.1%) is to fuel cogeneration plants. They are mainly used in residential sector wood-fired heating appliances such as wood-burners and boilers in France, Germany and Italy (85%,



90.6% and 68% respectively). European Union wood pellet output increased (by 6.2% between 2016 and 2017) albeit at a slower pace (from 14.4 to 15.3 Mt). Hence, 36.6% of the EU's wood pellet feedstock was imported (from the USA, Canada, and also Europe, e.g. the Ukraine).

NEWS FROM SOME OF THE PRODUCER COUNTRIES

DENMARK WANTS TO SET THE EXAMPLE

Data released by the Danish Energy Agency shows that solid biomass primary energy consumption increased in the Kingdom of Denmark... for the third year running. It was put at 3.2 Mtoe in 2017 (i.e. 14.2% year-on-year growth), compared to 2.8 Mtoe in 2016, 2.6 Mtoe in 2015 and 2.4 Mtoe in 2014. The increase resulted in much higher imports (primarily, wood pellets), from 1 Mtoe in 2015 to 1.5 Mtoe in 2017.

A sizeable share of this increase can be attributed to the country's coal- and gas-fired power plant conversions to CHP (the Studstrup 3 and Avedøre 1 power plants in 2016, and Skørboek 3 in 2017) running on biomass fuels (wood pellets and wood chips). The Danish Energy Agency reports a 54.5% increase in the plants' net installed electricity generating capacity using solid biomass feedstock in just three years, from 973.4 MW in 2015, to 1 031.7 MW in 2016 and 1 504.3 MW in 2017.

The conversions have led to higher solid biomass electricity output: 2.8 TWh in 2015, 3.5 TWh in 2016 and 4.8 TWh in 2017. The solid biomass contribution to supplying the country's district heating networks has also risen from 1 059 ktoe in 2015, to 1 139 ktoe in 2016 and 1 356 ktoe in 2017, i.e. 28.2% over the last two years. This trend echoes Denmark's policy on curbing climate warming. It aspires to be a carbon neutral society by 2050. Thus, in April 2018, the government unveiled a new energy programme "Energy – for a green Denmark" that set a target to supply at least 50% of its energy from renewable energy sources by 2030, the upshots being to stop using coal for generating electricity by 2030 and become a fossil fuel-free society by 2050. The plan has set a raft of measures to promote

renewable energies. Denmark plans to maintain its solid biomass subsidies for CHP plants already running on biomass, adjusting them to the EU's demands. Major subsidies (4 billion Danish krona equivalent to 536 million euros) are also earmarked to ensure continued expansion of biogas derived from methaniza-

tion and other green gases, such as thermal biogas and hydrogen produced from renewable energy sources. It plans to reduce taxes on electricity to foster the electrification of heating needs and electric mobility. It aims to set an example to other countries willing to engage in ecological transition. Hence, in October

Tabl. n° 1

Primary energy production and gross inland consumption of solid biomass* in the European Union in 2016 and 2017** (in Mtoe)

Country	2016		2017**	
	Production	Consumption	Production	Consumption
Germany	11.9	12.4	12.0	12.4
France***	11.0	11.0	10.8	10.8
Sweden	9.4	9.4	9.3	9.3
Finland	8.3	8.4	8.6	8.6
Italy	7.2	8.4	7.7	9.0
Poland	6.4	6.6	6.2	6.3
Spain	5.3	5.3	5.5	5.5
Austria	4.5	4.6	4.6	4.6
United Kingdom	3.7	6.2	4.3	6.7
Romania	3.6	3.6	3.6	3.6
Czechia	3.0	2.9	3.0	3.0
Portugal	2.6	2.4	2.6	2.4
Hungary	2.4	2.4	2.3	2.3
Latvia	2.1	1.3	2.0	1.4
Denmark	1.7	2.8	1.7	3.2
Croatia	1.5	1.3	1.5	1.3
Estonia	1.5	1.0	1.5	1.0
Netherlands	1.4	1.2	1.4	1.3
Lithuania	1.2	1.2	1.3	1.4
Belgium	1.3	2.1	1.2	2.0
Bulgaria	1.1	1.1	1.1	1.1
Slovakia	0.8	0.8	0.8	0.8
Greece	0.8	0.9	0.8	0.9
Slovenia	0.6	0.6	0.6	0.6
Ireland	0.2	0.3	0.2	0.3
Luxembourg	0.1	0.1	0.1	0.1
Cyprus	0.0	0.0	0.0	0.0
Malta	0.0	0.0	0.0	0.0
Total EU 28	93.7	98.2	94.8	99.8
*Excluding charcoal. **Estimate. ***Overseas departments included for France. Source: EurObserv'ER 2018.				

2018, it declared a new climate and air plan "Together for a greener future" that called on all Danes to come together and embrace shared responsibility for our planet. Key proposals include phasing out new diesel and petrol-driven vehicles by 2030, behavioural campaigns with climate labelling, a radical reduction in industrial and housing emissions and research efforts to develop carbon capture and storage technologies for use in the country's fields and forests.

SWEDEN ADOPTS A "CLIMATE" LAW

According to Statistics Sweden, solid biomass energy consumption in Sweden slipped by 0.8% from its 2016 level to 9.3 Mtoe in 2017. The reason for the drop is that less biomass energy was used in the paper and pulp sector. The trend was more positive in electricity production. As it is only generated by cogeneration plants, it exceeded 10 TWh (10.25 TWh

in 2017) for the first time, having grown by 5.1% in a year. Statistics Sweden puts the net maximum electricity capacity at 3 706 MW at the end of 2017. This capacity should soon rise when new plants – Borås (Borasenergi, 44 MW), Upplands Bro (E.ON Högbytorp, 85 MW) and Hyltebruk (Stora Endo Hylte, 28 MW) come on stream. In June 2017 the Swedish Parliament passed a framework law that came into



Tabl. n° 2

Gross electricity production from solid biomass* in the European Union in 2016 and 2017** (in TWh)

Country	2016			2017**		
	Electricity only plants	CHP Plants	Total electricity	Electricity only plants	CHP Plants	Total electricity
United Kingdom	19.589	0.000	19.589	20.763	0.000	20.763
Finland	1.004	9.599	10.603	0.918	9.973	10.890
Germany	4.775	6.019	10.794	4.600	6.100	10.700
Sweden	0.000	9.750	9.750	0.000	10.250	10.250
Poland	0.000	6.913	6.913	0.000	5.309	5.309
Denmark	0.000	3.486	3.486	0.000	4.798	4.798
Spain	3.212	0.836	4.048	3.458	0.907	4.365
Italy	2.226	1.899	4.125	2.196	1.997	4.193
Belgium	2.156	1.233	3.390	2.491	1.326	3.816
Austria	0.875	2.816	3.691	0.844	2.816	3.660
France***	0.419	3.032	3.450	0.419	2.922	3.341
Portugal	0.760	1.721	2.481	0.799	1.775	2.574
Czechia	0.014	2.053	2.068	0.004	2.209	2.213
Netherlands	1.116	0.791	1.907	1.099	0.674	1.772
Hungary	0.827	0.666	1.493	1.000	0.645	1.645
Slovakia	0.003	1.126	1.129	0.003	1.032	1.035
Estonia	0.127	0.713	0.840	0.200	0.733	0.933
Latvia	0.000	0.427	0.427	0.000	0.525	0.525
Romania	0.077	0.388	0.466	0.077	0.388	0.466
Ireland	0.379	0.016	0.395	0.366	0.016	0.381
Lithuania	0.000	0.269	0.269	0.000	0.303	0.303
Croatia	0.000	0.194	0.194	0.000	0.194	0.194
Bulgaria	0.003	0.160	0.163	0.003	0.160	0.163
Slovenia	0.000	0.137	0.137	0.000	0.155	0.155
Luxembourg	0.000	0.025	0.025	0.000	0.052	0.052
Greece	0.005	0.000	0.005	0.010	0.000	0.010
Total EU 28	37.568	54.269	91.837	39.249	55.258	94.507
*Excluding charcoal. **Estimate. ***Overseas departments included for France. Source: EurObserv'ER 2018.						



Biokraft heat plant,
Vartan, Sweden

force on 1 January 2018, that obliges the government to conduct a policy that toes the line with its parliament's climate goals. The law stipulates that part of the emission reduction could be covered by additional measures such as carbon sinks formed by the forests (by better forest management and extending forest coverage) and setting up climate projects abroad. Thus, Swedish forests should contribute more to the country's energy needs and at the same time strengthen its carbon sink role. The government must produce a climate report with its budget, and an action plan that guarantees its actions are apposite. The law aims to constrain society and the business world to ecological transition. The first of these reports should be delivered to Parliament during the second half of 2018. At the beginning of every parliamentary mandate, i.e. every four years, the executive must also produce a climate action plan. This will be presented in 2019 for the current parliamentary term. Sweden has set itself the goal of achieving carbon neutrality in 2045, which is five years ahead of the Paris Agreement recommendation, and an 85% GHG emission reduction compared to 1990 emission levels.

WOOD CONSUMPTION RECOVERS IN FINLAND

According to Statistics Finland, the country's solid biomass energy consumption rose again, from 8.4 Mtoe in 2016 to 8.6 Mtoe in 2017. Moreover, the country has the highest consumption by toe per inhabitant (see graph n°2). The reasons for this growth are the 2.7% increase in solid biomass electricity output to 10.9 TWh, and most of all, an increase in solid biomass energy consumption used directly by the paper and pulp industry. The sector's consumption actually increased by 195 000 toe in 2017, rising to 3.6 Mtoe. The size of Finland's forestry business is the reason why it is far and away the leading per capita biomass user at an annual rate of 1.6 toe consumed. It passed a climate change law in June 2015. One of the key planks of the law is its goal to reduce a CO₂ emissions by 80% in 2050 compared to 1990 emission levels.

MORE RESOURCES FOR RENEWABLE HEAT IN FRANCE

In France, household heating needs in 2017 were lower than in 2016. The very sharp cold snap in January was offset by

a strong thaw in February and March and above-average seasonal temperatures throughout the last quarter of the year. The slump in home heating needs had an impact on the overall solid biomass consumption statistics. According to the Observation and Statistics Service, France's gross domestic consumption of solid biomass (including the Overseas Territories) contracted by 2% dropping from 11 Mtoe in 2016 to 10.8 Mtoe in 2017. France also unveiled its National Low-Carbon Strategy (SNBC) and its Multiannual Energy Programme (PPE) on 27 November, which is the energy policy steering tool for the next 10 years, divided into two periods, 2018-2023 (revision) and 2024-2028. The PPE puts the emphasis on renewable heat, which according to the government represents a "key vector to decarbonation". It provides for building up the Heat Fund with a € 315 M budget in 2019 and € 350 M in 2020, accompanied by administrative simplification. New resources were allocated to the Heat Fund managed by Ademe in 2018. On 18 October, its board voted through a 14% budget increase for the 2018 fund. The initial € 215 M budget was increased to € 245 M. Ademe claims that from 2009 to 2016, the Heat Fund was given 1.6 bil-

lion euros to support roughly 4 000 projects and output totalling 2 million toe. Furthermore, the PPE has given itself the goal of "making a minimum rate of renewable heat compulsory for all new build heating installations (individual, collective and the services sector) from 2020 onwards". This new measure should boost the biomass heating appliance market in the construction sector, providing an alternative to HPs. The PPE partly placates the renewable heat professionals who raised the issue of the sector's late development in September 2018, "whose growth pace is three times

slower than the rate scheduled by the current Multiannual Energy Programme".

THE NORDIC COUNTRIES STIMULATE INDUSTRIAL PROJECTS

Biomass use has an impact on the models of the major energy groups who criss-cross the European continent. Their business is to deliver thermal or electrical energy in abundance, via huge plants that can supply thousands of households and

industries. One of the sector's groundswell movements is to gradually replace coal in power plants with biomass. There is no need for demolishing and rebuilding the plants as they can be adapted to operate using new fuels. The UK's Drax Group is gradually converting the country's coal-fired power plants, to adhere to the national target of phasing out coal by 2025, as we detailed in the EurObserv'ER 2017 Biomass barometer.

The Danish 50.1% state-owned group Orsted (formerly known as Dong Energy), has

Tabl. n° 3

Gross heat production from solid biomass* in the European Union in 2016 and in 2017** (in Mtoe) in the transformation sector***

Country	2016			2017		
	Heat only plants	CHP plants	Total Heat	Heat only plants	CHP plants	Total Heat
Sweden	0.711	1.765	2.477	0.709	1.808	2.518
Finland	0.668	1.092	1.760	0.711	0.995	1.706
Denmark	0.473	0.666	1.139	0.478	0.878	1.356
France****	0.533	0.498	1.031	0.569	0.555	1.124
Austria	0.543	0.341	0.884	0.547	0.360	0.908
Germany	0.217	0.399	0.616	0.208	0.401	0.609
Italy	0.078	0.464	0.542	0.080	0.473	0.553
Lithuania	0.392	0.096	0.488	0.422	0.124	0.545
Estonia	0.157	0.150	0.308	0.157	0.150	0.308
Latvia	0.114	0.137	0.251	0.135	0.157	0.292
Poland	0.048	0.271	0.319	0.054	0.205	0.260
Czech Republic	0.023	0.138	0.161	0.032	0.139	0.171
Hungary	0.064	0.060	0.124	0.056	0.060	0.116
Slovakia	0.045	0.080	0.125	0.040	0.073	0.113
Netherlands	0.027	0.022	0.049	0.024	0.077	0.101
Romania	0.037	0.035	0.072	0.037	0.035	0.072
Slovenia	0.009	0.019	0.028	0.011	0.020	0.030
Luxembourg	0.004	0.009	0.013	0.004	0.019	0.024
Croatia	0.000	0.022	0.022	0.000	0.022	0.022
United Kingdom	0.014	0.000	0.014	0.020	0.000	0.020
Bulgaria	0.010	0.005	0.015	0.010	0.005	0.015
Belgium	0.000	0.006	0.006	0.000	0.007	0.007
Total EU 28	4.169	6.276	10.445	4.305	6.564	10.869
*Excluding charcoal. **Estimate. ***Corresponds to "Derived heat" (see Eurostat definition). **** Overseas departments included for France. Source: EurObserv'ER 2018.						



also embarked on a sea change as it gradually abandons fossil fuels in favour of renewable energies. It aims to stop using coal by 2023. The group's annual report admits that only 13% of its energy production was renewably sourced in 2006, compared to 64% in 2017, and it seeks to source 80% renewably by 2020. Biomass plays a major part in this transition, as shown by the symbolic change to the name of one

of its branches, that was "Bioenergy and thermal energy" in the second quarter of 2018 and was renamed "Bioenergy" in Q3. In practical terms, the group has shut down 40% of its conventional production capacity, while the remaining gas and coal-fired power plants are scheduled for conversion to biomass. In time it will manage ten biomass power plants in Denmark and one in the Netherlands.

In October 2017, the group commissioned the new tranche of the Skarebaek power plant which is 100% fuelled by biomass. It will use 450 000 tonnes of wood chips per annum and has a design capacity of 95 MWe and 320 MWth. The heat produced will be distributed via a district heating network. The next power plant to be converted is at Asnaes, with a design capacity of 25 MWe and 125 MWth, and

Tabl. n° 4

Heat consumption from solid biomass in the countries of the European Union in 2016 and 2017** (in Mtoe)*

Country	2016	Of which direct use by end user	Of derived heat***	2017	Of which direct use by end user	Of derived heat***
Germany	9.716	9.100	0.616	9.852	9.243	0.609
France****	9.965	8.934	1.031	9.777	8.653	1.124
Sweden	7.852	5.376	2.477	7.792	5.275	2.518
Italy	7.123	6.582	0.542	7.453	6.900	0.553
Finland	6.922	5.162	1.760	7.048	5.342	1.706
Poland	5.170	4.851	0.319	5.253	4.993	0.260
Spain	4.005	4.005	0.000	4.059	4.059	0.000
Austria	3.839	2.955	0.884	3.934	3.027	0.908
Romania	3.465	3.393	0.072	3.472	3.400	0.072
United Kingdom	2.821	2.808	0.014	2.936	2.917	0.020
Denmark	2.367	1.228	1.139	2.626	1.270	1.356
Czechia	2.438	2.278	0.161	2.446	2.275	0.171
Hungary	2.014	1.890	0.124	1.916	1.800	0.116
Portugal	1.774	1.774	0.000	1.773	1.773	0.000
Belgium	1.318	1.312	0.006	1.267	1.261	0.007
Latvia	1.121	0.870	0.251	1.231	0.939	0.292
Croatia	1.171	1.149	0.022	1.171	1.149	0.022
Lithuania	1.110	0.621	0.488	1.157	0.612	0.545
Bulgaria	1.008	0.993	0.015	1.015	1.000	0.015
Greece	0.849	0.849	0.000	0.857	0.857	0.000
Netherlands	0.712	0.662	0.049	0.820	0.719	0.101
Estonia	0.730	0.423	0.308	0.742	0.434	0.308
Slovenia	0.585	0.556	0.028	0.562	0.531	0.030
Slovakia	0.513	0.388	0.125	0.501	0.388	0.113
Ireland	0.190	0.190	0.000	0.197	0.197	0.000
Luxembourg	0.059	0.045	0.013	0.067	0.044	0.024
Cyprus	0.006	0.006	0.000	0.006	0.006	0.000
Malta	0.001	0.001	0.000	0.001	0.001	0.000
Total EU 28	78.845	68.400	10.445	79.932	69.063	10.869

*Excluding charcoal. **Estimate. ***Essentially district heating (see Eurostat definition). ****Overseas departments included for France.
Source: EurObserv'ER 2018.

it should be operational again in 2019, leaving just one power plant outstanding, that of Esbjerg, scheduled for 2022, with a capacity of 56 MWe and 214 MWth. By that date, 7 power plants will have been converted since 2009, for a total of 1 272 MWe and 2 277 MWth. Apart from the European drive to convert coal-fired power plants, there is also a call to open new production units. In Sweden, on-going projects in the cities of Stockholm, Gothenburg, Malmö, Uppsala, Borås, Upplands Bro and Västerås amounted to a total investment of 1.68 billion euros in 2017 according to the Bioenergi annual report. The companies Fortum Värme, Göteborg Energi, E.ON and Vattenfall have invested 1.04 billion euros of this sum in preliminary feasibility studies calculated by the Tidningen Bioenergi report. If they are promising, considerably more money will have to be invested into the projects. The remaining investments have been made in projects whose construction is underway or that have started operating. For example, Härjeås Energi opened a CHP plant at Sveg, in the autumn of 2017, which required an investment of about 37 million euros. The plant's capacity is 10 MWe and 32 MWth. In Sweden, the energy companies, regardless of size appear to have entered a race to open biomass power plants, primarily CHP plants, although the electricity market conditions for opportunities are tough. As the country's electricity prices are low, they run the risk that new power plants will end up only supplying the country's heating networks. But biomass is also finding new opportunities, primarily in industry. A case in point is Cortus Energy AB, which constructed a 6 MW renewable gas production module in the Swedish town of Höganäs and commissioned it in June 2018. The feedstock is forest waste, based on technology known as "WoodRoll". The renewable gas will be sold to Höganäs AB, a steel mill, to replace the fossil gas used until now. The project drew on major research and development efforts. Cortus Energy has experimented with the technology on a test installation at Köping since 2011, aiming at the steel industry, which requires specific gas and high temperatures, without contaminating the final product. The Höganäs installation is the first capable of providing renewable energy to the

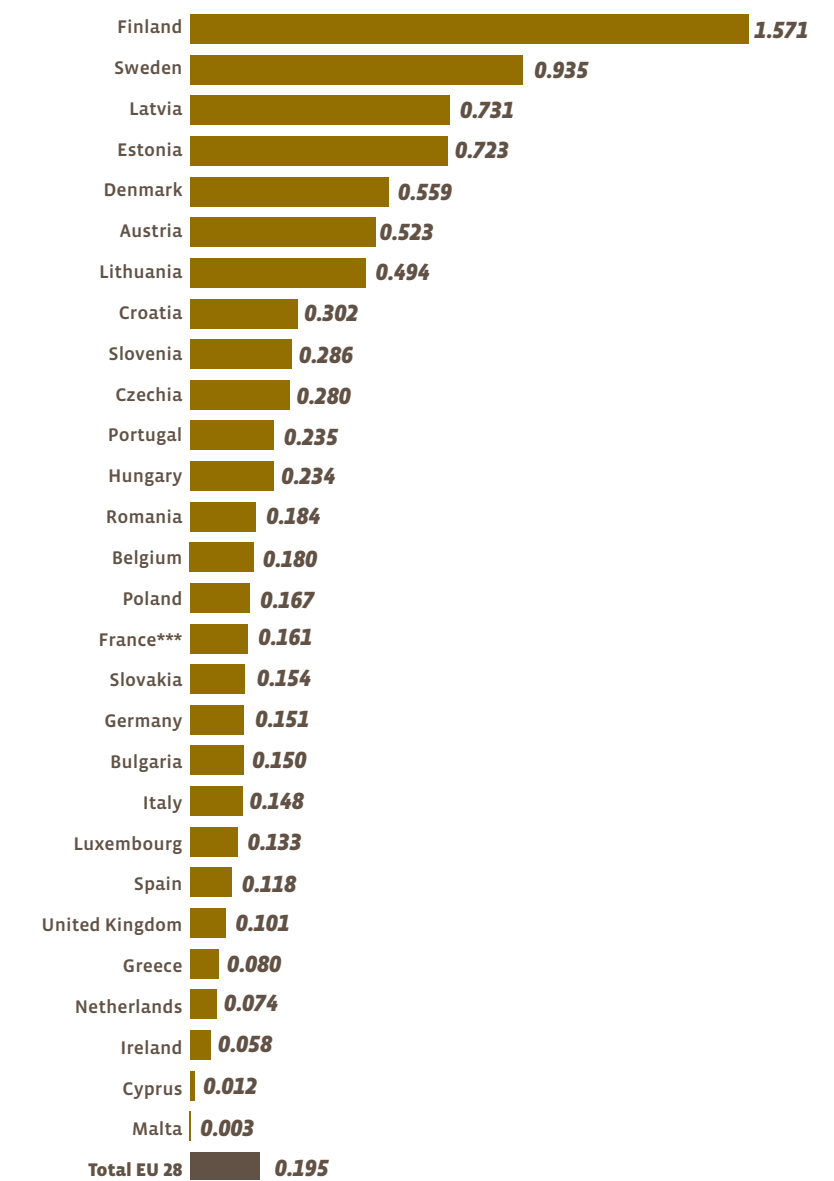
steel industry process, and thus serves as a demonstrator. The plant will save 10 000 tonnes of CO₂ emissions per annum, i.e. 3% of the town's emissions. Lastly, it is also a financial innovation because it is an energy feed-in contract, whose initial investment of 9.8 million euros was made by Cortus Energy AB, which will resell the gas to Höganäs AB for roughly 1.5 million euros per annum from 2019 onwards.

After introducing quality certification systems for wood pellet fuel, the sector has arranged to set up a new European certification mechanism to cover the quality of wood chip and wood waste used as fuel. It goes by the name of "GoodChips" and is awarded to fuel producers. It applies the criteria, allocation methods,



Graph. 2

Gross energy consumption of solid biomass by toe per inhab in the European Union in 2017***



*Excluding charcoal. **Estimate. ***Overseas departments included for France. Source: EurObserv'ER 2018.



Biomass arriving by ship
at Peel Ports Liverpool

JUSTIN THOMAS/VEIMEDIA/EDRAX GROUP

etc., defined by Bioenergy Europe. It institutes eight quality classes for wood chips and 4 for wood waste. It verifies elements such as moisture content, particle size and ash content. GoodChips aims to have a clear vision of product quality by applying reference standards, reducing raw material defects and GHG emissions, highlighting exemplary producers and facilitating exchanges between the

various stakeholders. GoodChips certification is inspired by Enplus certification which adopted the same approach for wood pellets. Enplus has existed since 2011 and has certified 900 firms across 45 countries. At the beginning of December 2018, the European Pellet Council (EPC) announced that it was launching a major Enplus certification overhaul campaign to tighten its specifications and proce-

dures. The new scheme should be ready by the end of 2019. Rapid growth in the number of large-scale biomass power plants also raises the issue of raw material procurement. It is vital that biomass needs are met responsibly and sustainably. The new renewable energies directive enforces sustainability requirements on biomass feedstocks to be included in the renewable energy share calculations of gross final energy consumption. The 6th and 7th paragraphs of Article 29 of the directive detail the criteria that must be met to reduce the risk of being produced in a non-sustainable manner. Biomass fuel derived from forestry work must come from countries that have implemented legislation that guarantees the lawfulness of forest operations, forest regeneration, and the maintenance or improvement of its capacity to produce biomass, the protection of classified areas under international or national law, the preservation of soil quality and biodiversity. Biomass fuels from forestry work must also fulfil land use, land-use change and forestry (LULUCF) criteria. In particular, they must be sourced from a signatory state to the Paris Agreements, that has made a defined national contribution to the United Nations Framework Convention on climate change and whose legislation or regulations guarantee that the emissions generated by the LULUCF sector do not exceed its emission reductions. The Commission has to decide how

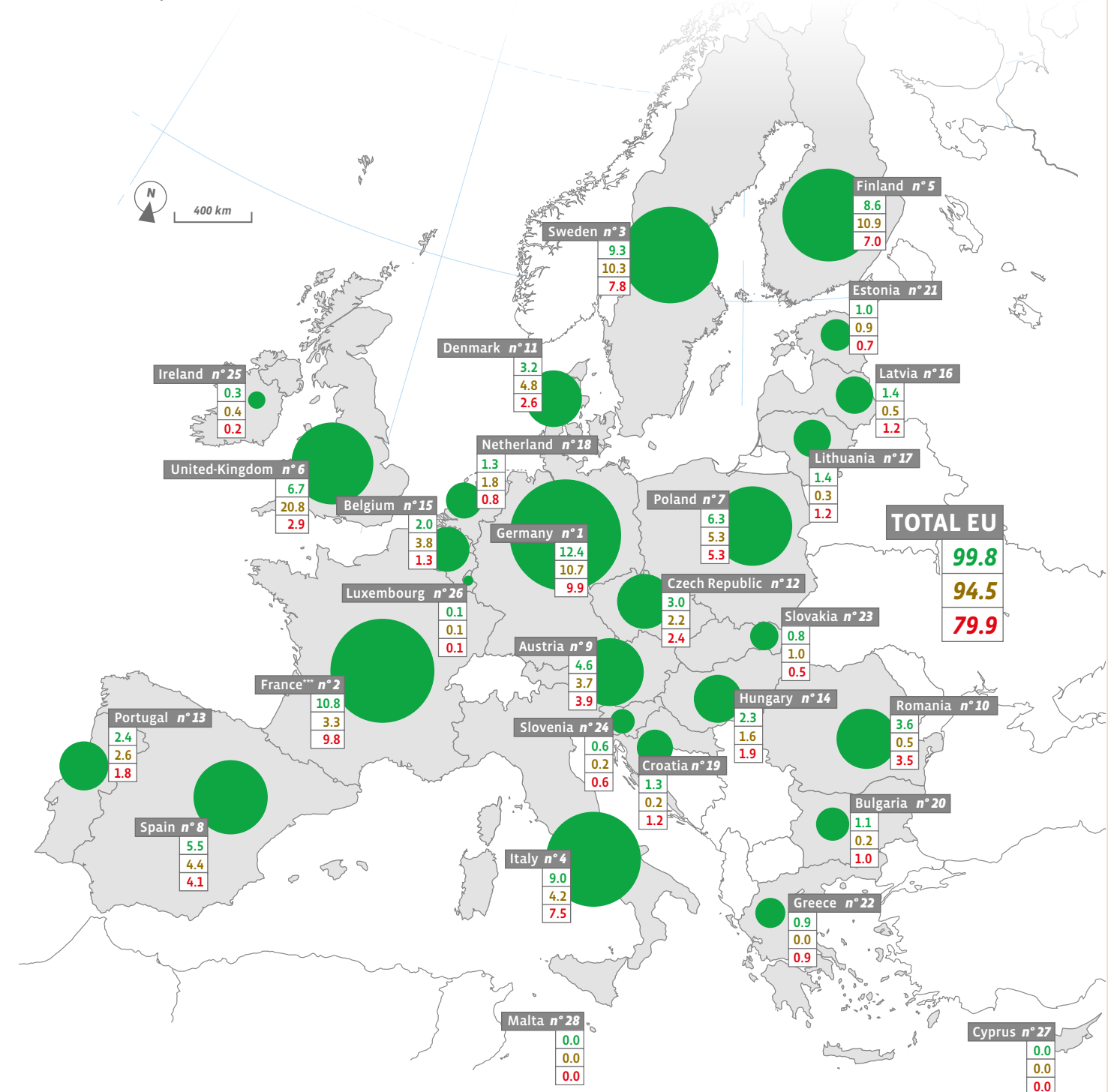
Tabl. n° 5

Major European operators of biomass plants in 2017

Operator	Country	Operational capacity (MW)	Production (MWh)
Drax Group	United-kingdom	n.c.	13 000
Orsted	Denmark	1 182 MWe 1 883 MWth	
Pohjolan Voima	Finland	765 MWe 1 388 MWth	n.c.
RWE	Netherland	655 MWe 350 MWth	
E.on	Germany	457,5 MWe 173,8 MWth	n.c.
StockholmExergi (Fortum Varne)	Finland	592 MWe 477 MWth	800 Twh 1 900 TWh heat
Vattenfall	Sweden	236 MW	400
Engie	France	285 MW	1 750
Zellstoff Stendal	Germany	135 MW	n.c.

Sources: Eurobserv'ER 2017, based on companies annual reports and communication.

Gross inland consumption, gross electricity production and heat consumption from solid biomass* in the European Union in 2017**



Key

10.8 Gross inland consumption of solid biomass in the European Union in 2017 (in Mtoe)

3.3 Gross electricity production from solid biomass in the European Union 2017 (in TWh)

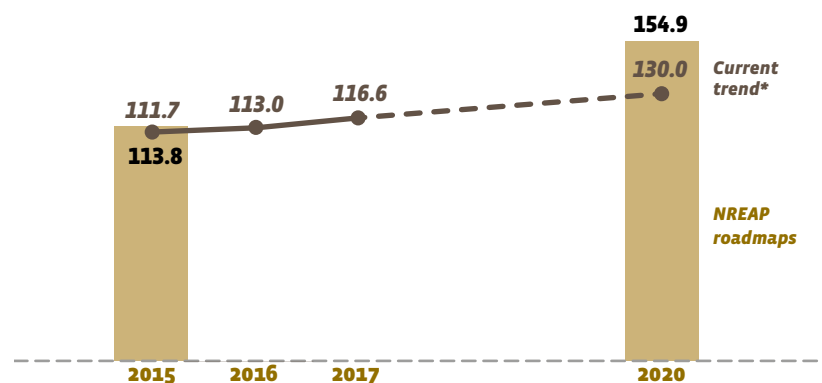
9.8 Heat consumption from solid biomass in the countries of the European Union in 2017 (in Mtoe)

*Excluding charcoal. ** Estimate. ***Overseas departments included for France. Source: Eurobserv'ER 2018.



Graph. n° 3

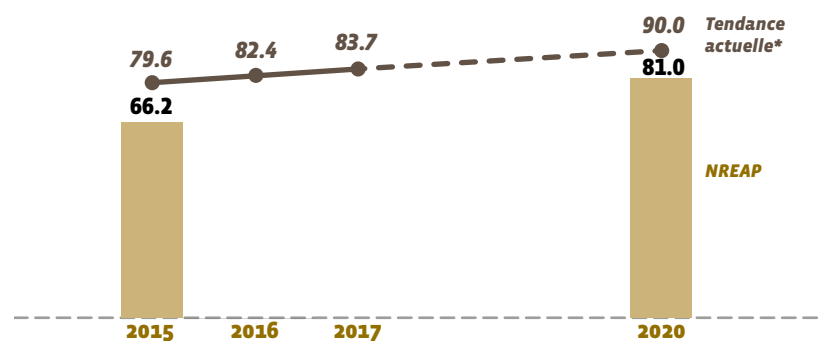
Comparison of the current trend of electricity production from solid biomass against the NREAP (National Renewable Energy Action Plan) roadmaps (in TWh)



These data include an estimate of the renewable electricity from waste incineration units.
Source: EurObserv'ER 2018.

Graph. n° 4

Comparison of the current trend of heat consumption from solid biomass against the NREAP (National Renewable Energy Action Plan) roadmaps (in Mtoe)



These data include an estimate of the renewable heat from incineration plants of municipal waste.
Source: EurObserv'ER 2018.

proof of compliance with these sustainability criteria will be demonstrated no later than 31 January 2021.

ELECTRICITY PRODUCTION SHOULD SPEED UP BY 2020

Many states have put solid biomass at the centre of their national renewable energy action plan strategy and more generally in their climate warming control strategy, because of its available potential and technical capacity to replace fossil fuels for producing heat and electricity.

The International Energy Agency forecasts presented in the Renewable 2018, Analysis and Forecast to 2023 report suggest that biomass energy consumption in all sectors directly earmarked for heating needs will continue to rise in the European Union, as shown in **graph n°4**. The IEA claims that biomass heat directly used by end users could reach 84 Mtoe in 2023 to which it adds a further 16 Mtoe of renewable heat (essentially biomass) delivered by heating networks – in other words the biomass heat contribution should approach 100 Mtoe in 2023. The IEA's interim forecasts for 2020 are

81 Mtoe of directly used biomass heat, plus 15 Mtoe of renewable heat delivered by heating networks (i.e. a biomass heat contribution in the region of 96 Mtoe). The IEA bases its prediction on the implementation of the updated version of the new renewable energy directive that provides for a 1.3 percent target increase in the renewable share of heating and cooling needs. The IEA has also identified the lead role of the European cement sector in industry to substantially increase the demand for biomass and waste-sourced heat.

The EurObserv'ER forecasts presented in **graph 3** are not directly comparable with those of the IEA because they single out solid biomass heat and also include heat from renewable solid municipal waste generated by incineration plants. This contribution is estimated at 90 Mtoe by 2020, i.e. 86 Mtoe from solid biomass and 4 Mtoe from renewable municipal waste. If biogas and liquid biomass heat are added to the equation, EurObserv'ER puts the combined biomass heat contribution at 93 Mtoe by 2020, which is slightly lower than the IEA forecast.

The IEA report also predicts an increase in bioenergy electrical capacity of 18% or so by 2023, i.e. 7.5 GW of additional capacity. The solid biomass sector will also benefit from the conversion of Danish coal-fired power plants, the spread of biomass cogeneration in Sweden (an additional 500 MW is expected by 2023 according to the IEA) and the expected boom in biomass co-firing in the Netherlands (e.g. the Amer and Eemshaven plants). In the Netherlands, several large biomass co-firing projects in existing coal-fired plants have been awarded SDE+ (Stimulation of Sustainable Energy production) subsidies. Output should be 7 TWh per annum by 2020. The UK, whose effective exit from the EU is due on 1 January 2021, following a transition period commencing on 29 March 2019, should also increase its bioenergy capacity by 2.1 GW by 2023. A sizeable part of this additional capacity will be up and running before 2020.

These elements indicate that solid biomass electricity production should grow very significantly in the next three years. EurObserv'ER believes that if the renewable municipal waste recovered in incineration plants as electricity is included, it could exceed 130 TWh in 2020.

In March 2018, the European Council asked the European Commission to present a climate strategy for 2050 by the first quarter of 2019, in line with the Paris Agreement, taking into account the national energy and climate plans due to be sent to the Commission before the end of 2018. The European Commission has made some headway. It provided a preliminary response in the form of its communication "A Clean Planet for all" on 28 November, which provides a strategic vision of the deep economic and social transformation required to implement a climate neutral economy. This strategy does not set targets, rather its purpose is to ensure that the transition is socially fair, and does not leave any Europeans or regions behind, while it enhances the competitiveness of the economy on global markets. According to the Commission, achieving a climate neutral economy by 2050 is feasible from a technical, economic and social standpoint but will call for deep societal and economic transformations within a generation. The

Commission has thus listed its strategic priorities to achieve a climate neutral economy. The first is to fully decarbonise the European energy supply system, with large-scale electrification of the energy system coupled with wide deployment of renewables, maximising the benefits of energy efficiency, which will entail almost halving energy consumption between 2005 and 2050, developing intelligent infrastructures and smart grids, reaping the benefits of the bio-economy and creating a carbon sink by developing sustainable agriculture and land management, setting up carbon capture and storage systems, rolling out clean, safe and connected mobility, putting industrial modernisation at the centre of a circular economy. The challenge for the member states is to determine the most beneficial forestry management model for the climate, between the amount of carbon dioxide avoided by using biomass instead of fossil fuels and the volume of carbon dioxide sequestered by woodlands. □

Sources: AGEE Stat (Germany), SEAI (Ireland Republic), DBEIS (United Kingdom), CBS (Netherlands), CRES (Greece), NSO (Malta), IDAE (Spain), SCB (Sweden), Statistics Austria, Statistics Lithuania, ENS (Denmark), STATEC (Luxembourg), DGE (Portugal), Statistics Finland, Terna (Italy), Ministry of Industry and Trade (Czechia), Ministry of Energy (Poland), SDES (France), SPF Economy (Belgium), University of Miskolc (Hungary), NSI (Bulgaria), Statistical office of the Republic of Slovenia, Statistics Estonia, Central Statistical Bureau of Latvia, Observ'ER, IEA.

The next barometer will cover wind power.



This project is funded by the European Union under contract n° ENER/C2/2016-487/SI2.742173

This barometer was prepared by Observ'ER in the scope of the EurObserv'ER project, which groups together Observ'ER (FR), ECN (NL), RENAC (DE), Frankfurt School of Finance and Management (DE), Fraunhofer ISI (DE) and Statistics Netherlands (NL). The information and views set out in this publication are those of the author(s) and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this study. Neither the Commission nor any person acting on the Commission's behalf may be held responsible for the use which may be made of the information contained therein.