



DEUTSCHE PELLETTINSTITUT

The Bioenergy Europe 2022 statistics report on wood pellet described the growth in pellet consumption within the EU-27 between 2020 and 2021 (18%) as staggering. EU-27 consumption rose to 24.5 million tonnes (Mt).

# +8.1%

*The growth of inland consumption from solid biofuels in the EU27 between 2020 and 2021*

## SOLID BIOFUELS BAROMETER 2022

A study carried out by EurObserv'ER.



**E**uropean Union solid biofuels energy consumption reached new peaks in 2021, and this trend extends to all forms from log wood, to pellets, wood waste and by-products. EurObserv'ER puts this 2021 figure at 104.2 Mtoe, which amounts to a 8.1% year-on-year rise. This growth spurt can be ascribed to a 7.8 Mtoe increase in consumption driven by a harsher 2020-2021 winter, a longer heating period in the main European Union climate zones, and by the hike in fossil energy prices in the second half of the year that made biomass fuels more competitive. Additional consumption is recorded in the European Union figures for both solid biofuels electricity output, which grew by 9.7 TWh and heat consumption which increased by almost 6.1 Mtoe over the previous winter's level.

### 93.0 TWh

*The electricity production from solid biofuels in the EU27 in 2021*

### 84.3 Mtoe

*The heat consumption from solid biofuels in the EU27 in 2021*



The European Union of 27 has never used so much solid biomass in energy production, as in 2021 it sailed past the 100-Mtoe threshold. On the basis of preliminary official Member States' data released to EurObserv'ER, consumption actually rose to 104.2 Mtoe in 2021 (Table 1), which equates to 8.1% year-on-year growth fuelled by an additional 7.8 Mtoe of consumption. This annual increase in solid biofuels

consumption is remarkable and even higher than that observed between 2010 and 2020 (of 7.1 Mtoe) (Graph 1). Hence, solid biomass is easily the top EU renewable energy sector, ahead of wind energy (33.2 Mtoe in 2021), hydro-power (31.8 Mtoe in 2021), heat pump renewable energy (ambient heat) (14.9 Mtoe in 2021) and even solar photovoltaic (13.6 Mtoe in 2021) (according to Eurostat's Early estimates).

**Tabl. n° 1**

Primary energy production and gross inland consumption of solid biofuels\* in the European Union in 2020 and 2021\*\* (in Mtoe)

	2020		2021	
	Production	Consumption	Production	Consumption
Germany	12.659	12.635	13.972	14.044
France	9.765	9.820	10.745	10.888
Sweden	9.502	9.487	10.264	10.199
Finland	7.935	8.402	9.040	9.541
Poland	8.964	9.330	8.880	9.081
Italy	7.124	8.353	7.590	8.874
Spain	5.049	5.049	5.278	5.278
Austria	4.993	4.856	5.357	5.247
Denmark	1.439	3.073	1.527	3.712
Czechia	3.522	3.367	3.913	3.689
Romania	3.401	3.395	3.625	3.639
Netherlands	1.531	2.252	1.725	2.741
Portugal	2.904	2.645	2.922	2.700
Hungary	2.036	2.053	2.068	2.075
Belgium	1.182	1.852	1.320	1.895
Bulgaria	1.680	1.609	1.812	1.783
Latvia	2.282	1.407	2.312	1.505
Croatia	1.511	1.312	1.791	1.477
Lithuania	1.273	1.284	1.396	1.419
Slovakia	1.321	1.313	1.363	1.363
Estonia	1.706	1.135	1.788	1.125
Greece	0.741	0.787	0.787	0.816
Slovenia	0.545	0.545	0.602	0.602
Ireland	0.225	0.270	0.248	0.293
Luxembourg	0.173	0.167	0.183	0.180
Cyprus	0.023	0.027	0.025	0.029
Malta	0.000	0.001	0.000	0.002
<b>Total EU 27</b>	<b>93.487</b>	<b>96.427</b>	<b>100.533</b>	<b>104.193</b>

\*Excluding charcoal.\*\* Estimate. Source: EurObserv'ER 2022.

**THE BIOMASS USED IS ESSENTIALLY OF EUROPEAN ORIGIN**

Solid biofuels production, namely the solid biofuels taken from European soil, is quantified at about 100.5 Mtoe for 2021, which is 7.5% more than in 2020 and amounts to a 7.0-Mtoe increase. The difference between national production data and gross domestic consumption equates to the balance of imports and exports, and stock variation. Across the European Union, net imports of solid biofuels remain low at about 3.5% of consumption and are primarily supplied by North American pellet imports and biomass fuel imports (wood and pellets) from the European Union non-member states.

The distribution between the various biomass fuels in domestic solid biofuels production of the European Union countries is clearly dominated by the "wood, wood residue and by-products" category, which should, according to EurObserv'ER, exceed 80% in 2021. In 2020, the ranking in line with Eurostat data was first at 78.8% for "wood, wood residue and by-products" (including 5.9% of wood pellets) followed by 14.1% of black liquor (a by-product of the paper pulp industry), 4.3% of other plant materials and residues, 1.8% of renewable industrial waste, 0.8% bagasse and 0.3% of animal waste.

There are two main reasons for the increase in solid biofuels consumption. In the first place, heating requirements in 2021 were greater than in previous years, because of the longer heating period. Many European regions experienced unusually high energy demands in March and April 2021. Eurostat has set up a technical indicator known as Heating degree days (HDD), based on weather forecasts to make an approximate estimate of energy consumption requirements for space heating, from one year or month to the next. The higher the season's HDD, the higher the heating requirement. According to the Eurostat database, the annual number of HDDs increased on average by 13.3% in the EU-27 between 2020 and 2021, rising from 2 759 to 3 126 HDD. The countries with the highest heating

requirements are Finland with 5 623 HDD (15.5% more than in 2020) and Sweden with 5 201 HDD (13.2% increase). The heating requirements of practically all the EU countries (except Ireland and Cyprus) increased in the three main EU climate zones. Examples of this are the 7% increase in Spain (1 663 HDD), 18.4% in France (2 412 HDD), 13.6% in Germany (3 114 HDD), and further east, 16.1% in Poland (3 491 HDD).

The other major reason for the increase in solid biofuels energy consumption is the hike in wholesale fossil energy prices and gas in particular, during the second half of 2021, against the backdrop of the post-COVID economic recovery. As a result, greater recourse was made to biomass fuels at the end of the year in multi-energy heating networks and CHP plants. Some utilities even planned to use up their maximum authorized pellet quota (see below). An analytical note on the price of natural gas for businesses in France and the European Union in 2021 released by the SDES (Sustainable Development Ministerial Statistical

Department) of the French Ministry of Ecological Transition in October 2022 claims that the price including supply, grid contribution and taxes excluding VAT in €/MWh GCV (current euros) increased by an average of 39% settling at about €38/MWh. In contrast, the 2020 level was particularly low, essentially because of the average EU rise in the supply price from €18 to €28/MWh. The highest supply prices in 2021 of over €40/MWh applied in Sweden and Denmark. These increases temporarily made the biomass kWh price very competitive, particularly in those countries where the gas price, and more generally that of the tonne of Co2, is heavily taxed. The gas price hikes for businesses were particularly punitive in three countries where the tax levels on natural gas are very high: Sweden (47%, i.e., €78/MWh), Denmark (106%, i.e., €60/MWh) and the Netherlands (45%, €45/MWh). The price of gas for Belgian businesses almost doubled (93%) but to about €35/MWh, as the tax on Belgian gas is lower. The rise in fossil energy prices can also

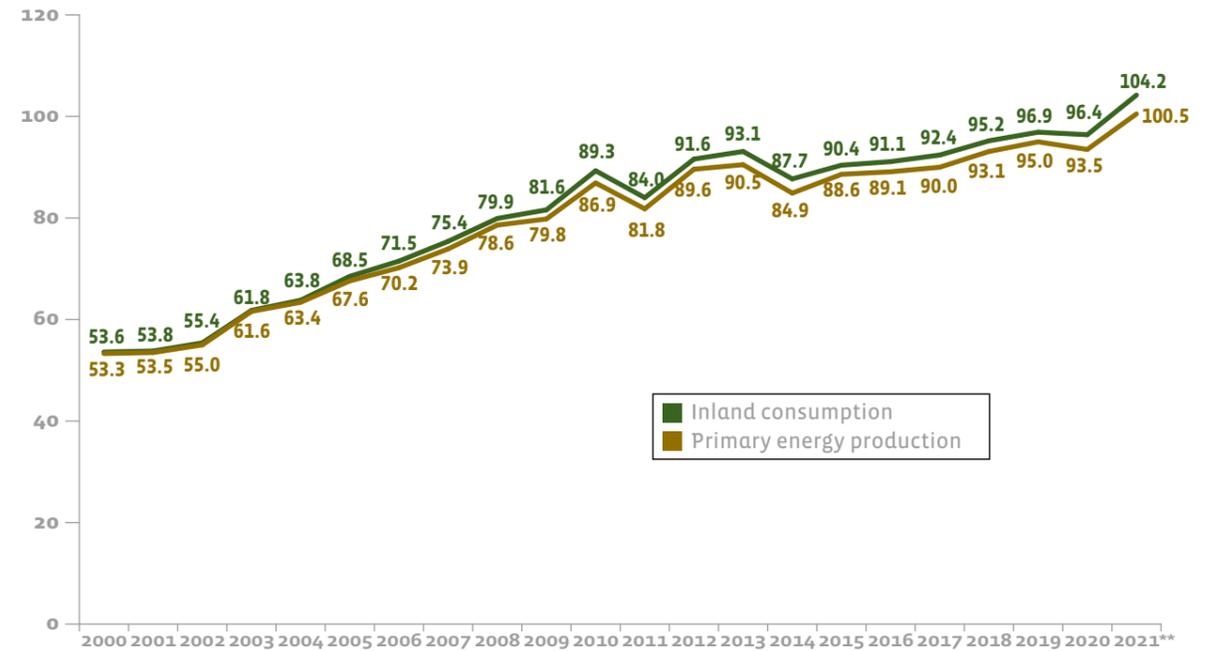
be ascribed to consumers' enthusiasm for pellet fuel, be it in the residential segment, to supply domestic heating appliances or the industrial segment, to supply biomass combined power and heat plants, for heating networks or industrial process heat. This vogue has been amplified because for many years, the public authorities have promoted the purchase of pellet burners in new build and to replace old fuel oil-, gas- and coal-fired boilers. This year, the pellet burner base performed at its optimum.

**THE STAMPEDE FOR WOOD PELLETS**

Wood pellet consumption is one of the main solid biofuels energy growth drivers. The Bioenergy Europe 2022 statistics report on wood pellets, produced in conjunction with the European Pellet Council, described the growth in pellet consumption within the EU-27 between 2020 and 2021 (18%) as staggering. EU-27 consumption reached 24.5 million

**Graph. n° 1**

Solid biofuels primary energy production and inland consumption\* growth figures for the EU27 since 2000 (in Mtoe)



\*Excluding charcoal. \*\*Estimate. Sources: years 2000-2019 Eurostat, years 2020 and 2021 EurObserv'ER.



tonnes (Mt). The report points out that the year-on-year increase was higher in the residential and commercial sectors (17%, i.e., an additional 2.65 Mt) than in the industrial sector (11%, i.e., an additional 1.7 Mt). The report also attributes this increase to a much longer heating season than in the winter of 2020. In many European regions, the demand for energy was higher than usual through March and April 2021, which

unexpectedly sustained the demand for pellets, allowing most suppliers to clear their stocks. The energy crisis triggered by Russia's February 2022 invasion of Ukraine exacerbated this year's demand for pellets, creating unsatisfied demand and sharp price increases. The report warns that demand could remain strong in the residential sector but that the market will be restrained for a while by availability issues, compounded by

the sanctions imposed on Russia and Belarus that have reduced the quantity of pellets in the European market. As for wood pellet use in the European Union, the report indicates that the residential and commercial sectors accounted for 66.1% of European pellet consumption, while industry accounted for the remaining 33.9%. Wood pellet consumption methods vary from country to country. Industrial

consumption, for generating electricity and CHP plants is the main market for the Netherlands (electricity power plants only) and Denmark (CHP plants only). In Italy, Germany and France, the residential heating sector drives wood pellet consumption. The top four European Union consumer countries are Denmark (3.4 Mt, 25% growth), Italy (3.4 Mt, 7% growth), the Netherlands (3.3 Mt, 40% growth) and Germany (2.9 Mt, 29% growth). Wood pellets are primarily used for generating heat. The EPC Survey 2022 indicates that 19.2 Mt of the 24.5 Mt were devoted to heat production, which is a 17.4% year-on-year increase (residential heating, commercial heating and heating networks supplied by CHP plants). The top five "pellet" heat consumer countries are Italy (3.4 Mt), Germany (2.9 Mt), France (2.7 Mt), Denmark (2.6 Mt) and Sweden (2 Mt). The remaining 5.3 Mt were used to generate electricity in power plants either running wholly as power plants or as cogeneration plants. The report blames the energy, fossil fuel and electricity price hikes for the sharp rise in wood pellet consumption in the industrial sector which has risen from 6.85 to 8.28 Mt. Towards the end of 2021, industrial wood pellet prices were even lower than those of coal supplying industrial demand. This increase in industrial consumption hit the other sectors, by reducing the pellet volumes available to them. The sharp rise in the price of electricity thus prompted power plant operators to acquire premium pellets, which are normally earmarked for residential heating. This additional demand created tensions in a market that was already compromised by supply issues and resulted in price rises and unsatisfied demand. The pellet sector is also subject to production cost increases (essentially electricity) and the dearth of raw materials caused by the slowdown in the sawing industry, which raised its prices sharply in 2022 as demand rose. To meet this demand, European Union countries continued to increase their production capacity in 2021 which rose by 6.2% between 2020 and 2021 (from 24.1 to 25.6 Mt), resulting in the opening of 21 new production sites and taking their total number to 774 by the end of 2021. Actual output increased by 8.9%, from 18.3 million



*The Cergy-Pontoise (Val-d'Oise) biomass boiler plant and its 57 kilometres of caliducts that supply heat to 33 000 dwellings in the communes of Cergy, Pontoise, Saint Ouen l'Aumône and Éragry-sur-Oise. The network also supplies heat to 600 000 m2 of public amenities and offices.*

tonnes to almost 20 million tonnes, the remaining requirements being fulfilled by imports (primarily from other European countries and North America).

#### SHARP RISE IN FINAL ENERGY CONSUMPTION

Primary energy is the energy contained in natural resources prior to any processing. Final energy is the energy used by the consumer, after being transformed and transported, used and invoiced at the point of use. EurObserv'ER differentiates these two types of final energy use from solid biofuels as electricity (Table 2) and heat (or cooling). Distinction is made between solid biofuels heat from the processing sector, i.e., distributed via heating networks (Table 3) and the heat used directly by end users (in the residential, industrial and agricultural sectors) (Table 4).

In the EU-27, solid biofuels electricity output in 2021 was measured at 93 TWh. Of that, 76.8% was supplied by combined heat and power plants posting double-digit growth (11.7%) between 2020 and 2021. Finland, having conceded its top

rank in 2020, was the European Union's leading biomass electricity producer with 12.7 TWh in 2021 (producing 1.9 TWh more than in 2020). Sweden came second with 11.2 TWh in 2021 (1.7 TWh compared to 2020). Germany slipped into third place (10.9 TWh in 2021) as its output dropped by 0.4 TWh. The biggest increases were made by Denmark and the Netherlands, which both massively increased their imports (particularly of wood pellets) and not by the two leading forestry countries, Finland and Sweden. Denmark increased its output by 65.8% to 7.1 TWh in 2021 (a 2.8-TWh increase) and the Netherlands by 35.9% to 7.9 TWh in 2021 (a 2.1-TWh increase).

In 2021, heat production was the main beneficiary of the increase in solid biofuels energy consumption. EurObserv'ER reckons that end user consumption of solid biofuels heat increased by 6.4% between 2020 and 2021 to 71.1 Mtoe, which is a 4.3 Mtoe gain on 2020. Most of this increase can be put down to the strong demand for heat in the residential sector, especially in Germany (1.5-Mtoe increase, a 16% year-on-year rise) and France (0.9-Mtoe increase, a 11.2% year-on-year rise). Significant growth rates were also posted in other major solid biofuels consumer countries such as Belgium (15.2%), Austria (11.2%), and Italy (9.5%). Growth in the amount of solid biofuels heat sold to heating networks (from the

**Tabl. n° 2**

*Gross electricity production from solid biofuels\* in the European Union in 2020 and 2021\*\* (in TWh)*

	2020			2021		
	Electricity only plants	CHP plants	Total	Electricity only plants	CHP plants	Total
Finland	0.000	10.760	10.760	0.000	12.668	12.668
Sweden	0.000	9.501	9.501	0.000	11.243	11.243
Germany	5.230	6.075	11.305	5.060	5.850	10.910
Netherlands	1.012	4.773	5.785	2.453	5.406	7.860
Denmark	0.000	4.302	4.302	0.000	7.133	7.133
Poland	1.557	5.376	6.933	1.446	4.991	6.437
Spain	3.646	0.895	4.541	4.116	0.979	5.095
Italy	2.180	2.291	4.470	2.385	2.144	4.529
France	0.459	3.396	3.854	0.691	3.623	4.314
Austria	1.090	2.872	3.962	0.928	2.950	3.878
Portugal	1.454	1.753	3.207	1.346	2.046	3.392
Belgium	2.034	1.285	3.319	1.458	1.306	2.763
Czechia	0.002	2.497	2.499	0.001	2.663	2.665
Bulgaria	0.173	1.300	1.472	0.278	2.094	2.373
Hungary	0.563	1.101	1.664	0.601	1.174	1.775
Estonia	0.320	1.426	1.746	0.314	1.400	1.714
Slovakia	0.000	1.120	1.120	0.000	1.071	1.071
Croatia	0.000	0.559	0.559	0.000	0.713	0.713
Romania	0.061	0.433	0.494	0.032	0.548	0.580
Latvia	0.000	0.520	0.520	0.000	0.570	0.570
Ireland	0.408	0.022	0.430	0.447	0.024	0.471
Lithuania	0.000	0.373	0.373	0.000	0.387	0.387
Luxembourg	0.000	0.266	0.266	0.000	0.285	0.285
Slovenia	0.000	0.155	0.155	0.000	0.169	0.169
Greece	0.012	0.038	0.050	0.016	0.026	0.042
<b>Total EU 27</b>	<b>20.199</b>	<b>63.087</b>	<b>83.286</b>	<b>21.573</b>	<b>71.463</b>	<b>93.036</b>

\*Excluding charcoal. \*\*Estimate. Source: EurObserv'ER 2022.



processing sector) rose to 15.8%. It reached 13.2 Mtoe in 2021 (an increase of 1.8 Mtoe), mostly supplied by cogeneration plants, amounting to a 61.4% share in 2021 (62.4% in 2020). The increase in solid biofuels heat output was generalized to almost all the European Union countries. Among the main countries with biomass heating networks, the highest rises were measured in Sweden (582 ktoe, 26.9% more than in 2020) and Finland (447 ktoe, 27.4% more than in 2020). High growth levels were also recorded in Denmark (234 ktoe, 15.8% more than in 2020), France (180 ktoe, a 16.1% rise) and Austria (91 ktoe, an 8.9% rise), namely the five countries whose processing sector biomass heat output exceeds the one Mtoe threshold.

### THE RIPPLE EFFECT ON NATIONAL CONSUMPTION RECORDS

The context of a longer, harsher winter than that of previous years and surging electricity and gas prices was ripe for setting new solid biofuels energy consumption records in many EU countries, not only for those in the North but also for France, Germany and some others.

### FULL POWER WOOD CHP IN SWEDEN AND FINLAND

Statistics Finland claims that Finland set a new solid biofuels energy consumption record of over 9.5 Mtoe in 2021 (its previous record set in 2019 was 9 Mtoe),

(a 13.6% year-on-year rise), or 1.1 Mtoe. Its output slipped (9 Mtoe in 2021) and is unusual in that black liquor was the feedstock for 43.9% (i.e., 4 Mtoe) of its 2021 output, which reflects the size of its pulping and paper pulp industry. This partly explains the fact that the country is by far the leading consumer of biomass per capita (1.7 toe/capita in 2021) (graph 2). The same source reports that solid biofuels heat delivered by heating networks (produced by the processing sector) increased more vigorously in 2021 (by 27.4% compared to 2020) and exceeded 2 Mtoe for the first time (2.08 Mtoe to be exact). Half of this heat was produced by CHP plants. Heat directly used by end users also increased (by 6.2%) with consumption

at 5.5 Mtoe in 2021. Developments by its Swedish neighbour were similar. According to Statistics Sweden, a new solid biofuels energy consumption record was set, crossing the 10 Mtoe mark for the first time (10.2 Mtoe in 2021, with 7.5% growth). Incidentally, Sweden leads the rest of the European Union for biomass heating networks with 2.7 Mtoe of output in 2021 (26.9% more than in 2020). Heat directly consumed by end

users slipped slightly on its 2020 level (by 91 ktoe) to 5.5 Mtoe.

### GERMANY PASSES THE 14-MTOE MARK

Much cooler weather than in recent years drove the sharp rise in Germany's biomass energy consumption. According to AGEE-Stat, the Working Group on Renewable Energy Statistics mandated by the Federal Ministry for

the Environment, Nature Conservation and Nuclear Safety (BMU), primary biomass energy consumption reached the 14-Mtoe threshold for the first time in 2021, equating to 11.2% year-on-year growth and 1.4 Mtoe of additional consumption. This increase was exclusively assigned to heating needs directly consumed by end users, which

Tabl. n° 3

Gross heat production in the transformation sector from solid biofuels\* in the European Union in 2020 and in 2021\*\* (in Mtoe)

	2020			2021		
	heat only plants	CHP plants	Total	heat only plants	CHP plants	Total
Sweden	0.604	1.561	2.165	0.764	1.983	2.747
Finland	0.784	0.849	1.633	1.024	1.056	2.080
Denmark	0.478	1.005	1.483	0.534	1.182	1.717
France	0.549	0.567	1.115	0.679	0.616	1.295
Austria	0.612	0.413	1.025	0.675	0.442	1.116
Germany	0.153	0.457	0.610	0.196	0.466	0.662
Lithuania	0.368	0.144	0.512	0.413	0.149	0.562
Poland	0.100	0.345	0.446	0.103	0.354	0.457
Netherlands	0.095	0.227	0.321	0.120	0.267	0.386
Italy	0.096	0.409	0.506	0.089	0.295	0.385
Latvia	0.172	0.163	0.335	0.191	0.180	0.371
Estonia	0.106	0.225	0.331	0.109	0.233	0.343
Czechia	0.040	0.174	0.214	0.051	0.200	0.251
Bulgaria	0.009	0.132	0.141	0.012	0.186	0.198
Slovakia	0.041	0.088	0.129	0.045	0.097	0.143
Luxembourg	0.004	0.092	0.096	0.005	0.099	0.104
Croatia	0.000	0.080	0.080	0.001	0.099	0.100
Hungary	0.032	0.054	0.086	0.034	0.058	0.092
Romania	0.021	0.061	0.081	0.018	0.067	0.085
Slovenia	0.012	0.028	0.039	0.013	0.031	0.043
Belgium	0.000	0.011	0.011	0.000	0.021	0.021
<b>Total EU 27</b>	<b>4.276</b>	<b>7.083</b>	<b>11.359</b>	<b>5.076</b>	<b>8.080</b>	<b>13.156</b>

\*Excluding charcoal. \*\*Estimate. Source: EurObserv'ER 2022.

Tabl. n° 4

Heat consumption from solid biofuels\* in the countries of the European Union in 2020 and 2021\*\* (in Mtoe)

	2019			2020		
	Total	of which final energy consumption	Of which derived heat**	Total	of which final energy consumption	Of which derived heat**
Germany	9.877	9.267	0.610	11.410	10.748	0.662
France	8.759	7.644	1.115	9.793	8.498	1.295
Sweden	7.731	5.567	2.165	8.222	5.476	2.747
Poland	7.892	7.447	0.446	7.744	7.287	0.457
Finland	6.808	5.175	1.633	7.574	5.494	2.080
Italy	6.969	6.463	0.506	7.464	7.079	0.385
Austria	4.037	3.013	1.025	4.466	3.350	1.116
Spain	3.643	3.643	0.000	3.709	3.709	0.000
Romania	3.432	3.350	0.081	3.636	3.551	0.085
Czechia	2.796	2.582	0.214	3.080	2.830	0.251
Denmark	2.465	0.983	1.483	2.728	1.011	1.717
Portugal	1.802	1.802	0.000	1.766	1.766	0.000
Hungary	1.614	1.528	0.086	1.617	1.525	0.092
Belgium	1.156	1.146	0.011	1.341	1.320	0.021
Latvia	1.240	0.905	0.335	1.293	0.922	0.371
Croatia	1.142	1.062	0.080	1.278	1.178	0.100
Bulgaria	1.293	1.152	0.141	1.248	1.049	0.198
Lithuania	1.143	0.631	0.512	1.199	0.637	0.562
Slovakia	1.026	0.897	0.129	1.152	1.009	0.143
Netherlands	1.017	0.696	0.321	1.100	0.714	0.386
Greece	0.760	0.760	0.000	0.789	0.789	0.000
Estonia	0.763	0.432	0.331	0.751	0.408	0.343
Slovenia	0.502	0.462	0.039	0.557	0.513	0.043
Ireland	0.180	0.180	0.000	0.192	0.192	0.000
Luxembourg	0.123	0.027	0.096	0.133	0.029	0.104
Cyprus	0.026	0.026	0.000	0.027	0.027	0.000
Malta	0.001	0.001	0.000	0.002	0.002	0.000
<b>Total EU 27</b>	<b>78.198</b>	<b>66.839</b>	<b>11.359</b>	<b>84.268</b>	<b>71.113</b>	<b>13.156</b>

\*Excluding charcoal \*\* Gross heat production in the transformation sector. Source: EurObserv'ER 2022.





rose from 9.3 Mtoe in 2020 to 10.7 Mtoe 2021. Heat produced by the processing sector only increased by several tens of ktoe (52 ktoe). The capacity of power-only and CHP plants using solid biofuels changed slightly. It actually contracted (3.5% compared to 2020) to 10.9 TWh. The growth in German solid biofuels energy consumption was largely driven by pellet fuel. According to the Bioenergy Europe report, Germany's consumption increased by 29% between 2020 and 2021 to 2.9 million tonnes in 2021 and almost all of it was used to produce heat. Demand for this fuel was boosted by higher pellet boiler sales. According to the Federation of German Heating Industry (BDH) statistics, sales of pellet burners increased by 51% between 2020 and 2021 to 53 000 units of the 76 500 biomass-fired heating appliances (wood, wood shavings, combination boilers).

#### FRANCE APPROACHES THE 11-MTOE THRESHOLD

France enjoyed the same low-temperature weather patterns at the beginning and end of 2021, after a historically mild winter of 2020, that led to higher actual consumption of buildings. While economic recovery and a harsher winter stimulated additional use of fossil energies, the situation also benefitted solid biofuels energy which is very widely used for heating purposes. According to the SDES, at around 7 Mtoe in 2021, wood is the main renewable energy used for space heating ahead of heat pumps (3.2

Mtoe). The SDES puts solid biofuels primary energy consumption as a whole at 10.9 Mtoe in 2021, which sets a new consumption record and eclipses the 10.7 Mtoe consumed in 2016. Year-on-year consumption increased 10.9% with additional input of 1 Mtoe.

While most of this rise can be put down to additional heating needs, solid biofuels electricity production also benefitted, increasing by 11.9% to reach 4.3 TWh in 2021, i.e., almost half a terawatt more than in 2020. At the end of 2022, France, according to the Observ'ER electricity barometer, had 64 solid biofuels plants generating electricity, for 800.3 MWe of capacity. The sector thus reached its 2020 multi-annual programming (PPE) targets to achieve 800 MWe a year ahead of its 2023 deadline (same level as 2028). This capacity is bound to progress with the commissioning and constructions of projects winning the CRE 5 tender, whose third round retained 14 projects for 74.1 MWe of electrical capacity. The 14.6-MWe Novawood project, jointly led by Novacarb, a Seqens Group subsidiary, and Engie Solutions, at Laneuveville-devant-Nancy (Meurthe-et-Moselle) went on stream in September 2022. Construction of the (25-MWe) Golbey (Vosges) project led by the Norske Skog group began in November 2022.

After several years in the doldrums for industrial biomass heat because of very low gas prices, activity is picking up pace. In 2020, the industrialists anticipated the increase in energy prices and

*The Federation of German Heating Industry (BDH) statistics reports that sales of pellet burners increased by 51% between 2020 and 2021 to 53 000 units of the 76 500 biomass-fired heating appliances (wood, wood shavings, combination boilers).*

sought to keep future energy expenses under control through biomass heat. According to ADEME, the number of projects supported through BCIAT (Biomass Heat Industry Agriculture and Tertiary) tenders rose dramatically in 2020 and 2021, carried by two support mechanisms, investment subsidies (via the Heat Fund) and operating subsidies via the Industry Decarbonization Fund (set up in 2020). ADEME reports that about fifty projects have taken advantage of the two mechanisms to produce about 3 TWh of energy. The prospects for 2022 also look very promising. The Heat Fund has received 150 million euros of additional funding to raise its budget to 520 million euros as part of the national recovery and resilience plan decided on after war broke out in Ukraine. This mechanism will enable France to make up for some of its delays in the area of renewable heat. The Heat Fund budget envelope is similar to the amount of the fine that France would have to pay for not having met its binding commitments taken in 2008 under the terms of the Renewable Energies Directive.

#### THE NETHERLANDS HAS DOUBLED ITS CONSUMPTION IN THE SPACE OF THREE YEARS

Over the last three years, the Netherlands' solid biofuels energy consumption has steadily surged. According to Statistics Netherlands, solid biofuels primary energy consumption increased again – by 21.7% between 2020 and 2021 (490 ktoe) – to just under 2.7 Mtoe, after two previous year-on-year increases of 45% and 29.5%. Primary energy consumption has thus more than doubled over its 2018 level, when it stood at 1.2 Mtoe. Most of this growth can be ascribed to an increase in its net imports (balance between imports and exports) that rose from 113 ktoe in 2019 to 1 016 ktoe in 2021. This increase mainly comprises wood pellet imports intended to supply its power

plants. The Netherlands' solid biofuels electricity production has surged, rising from 2.8 TWh in 2019, to 5.8 TWh in 2020 then to 7.9 TWh in 2021, encouraged by the rollout of its SDE+ programme. Growth has been enabled by increased wood pellet consumption used in co-combustion with coal in the RWE Amers (1560-MW), RWE Eemshaven (600-MW) and Rotterdam's Uniper MPP3 (272-MW) power plants. Rotterdam's Onyx power plant (730-MW) was also restarted in 2021. In 2020, the RWE Amer power plant at Geertruidenberg declared that it had increased the biomass fraction in co-combustion from 50 to 80% and, the same year, its Eemshaven power plant started co-combustion to replace 15% of its coal feedstock. In 2021, the RWE and Uniper power plants anticipated maximum use of the authorized amount of biomass pellets: namely 1 600 000 tonnes for Amer, 800 000 tonnes for Eemshaven and 540 000 tonnes for Uniper, Rotterdam. However, the long-term sustainability of their consumption volumes hangs in the balance. As it stands, the Dutch government plans to put an end to subsidies for electricity produced from biomass in 2027, coinciding with the end of SDE+ subsidies. This suspension will not be applied to the biomass used in combined heat and electricity production. The government is currently drafting legislation to phase out coal from electricity production. The Netherlands has strongly encouraged investments in industrial biomass boiler operating as cogeneration or other plants in addition to co-combustion. Biomass heat output from the processing sector increased by 20.2% between 2020 and 2021 (386 ktoe in 2021).

#### THE ECONOMIC ENVIRONMENT IS READY TO WELCOME INDUSTRIAL APPLICATIONS

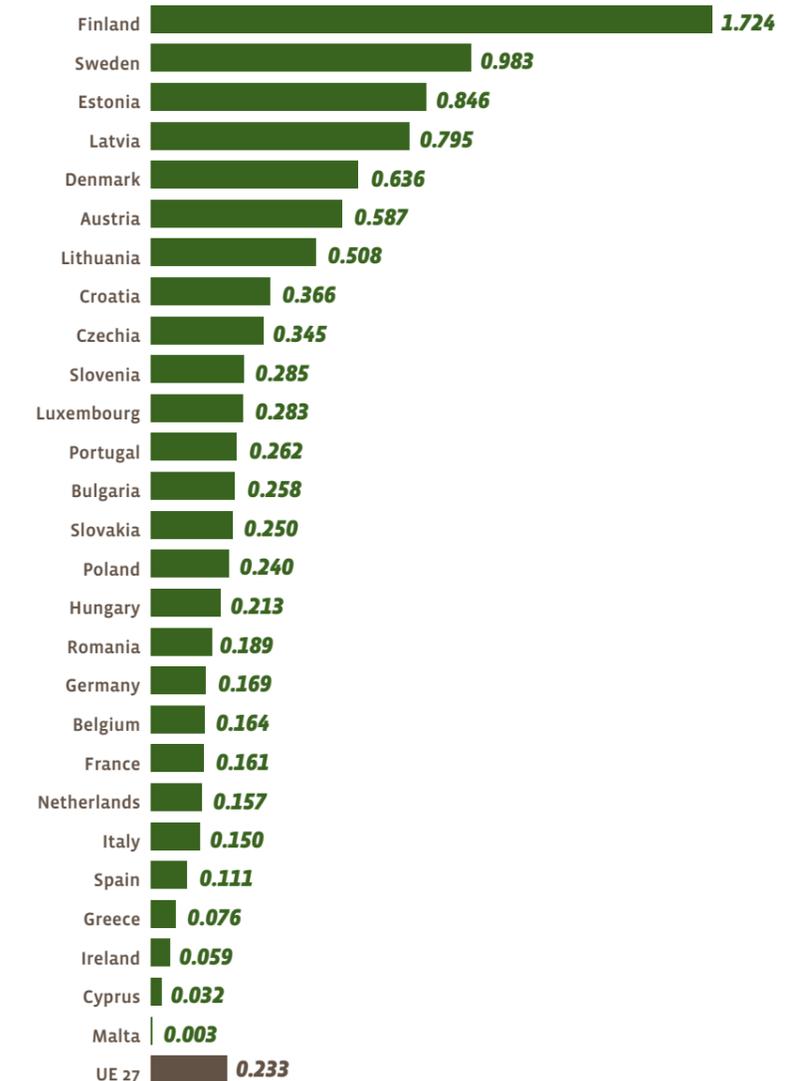
Although they have been active and promoted by the public authorities, industry's biomass heat markets have lost steam in recent years. Since the second half of 2021, the situation has dramatically changed with the rapid rise in fossil energy prices fed by post-Covid recovery compounded by the onset of war in Ukraine. Wild gas price fluctuations naturally led businesses to turn to alternative solutions such as

biomass. The industrial biomass heat market, historically linked to the timber and paper industries, is gradually opening up to major industrial users of energy unrelated to the timber sector, such as chemicals, transport and food-processing industries. This movement is gaining momentum with the determination of the latter to reduce their dependence on gas and complete their energy transitions. Recently, and by way of illustration, the Renault Group and

Dalkia signed a fifteen-year partnership agreement on 24 November 2022 to supply decarbonized heat to the Maubeuge car plant by installing a biomass boiler plant and waste heat recovery systems on site. The 15-MW capacity boiler should enable the plant to reduce its natural gas consumption by 65%. One of the most recent projects to emerge, constructed by a Suez-Indaver joint

#### Graph. 2

*Gross inland consumption of solid biofuels\* in toe per inhabitant in the European Union in 2021\*\**



\*Excluding charcoal \*\* Estimate Source: EurObserv'ER 2021.



**AMENDMENTS OF THE EUROPEAN PARLIAMENT, ADOPTED ON SEPTEMBER 14, 2022 AS PART OF THE DRAFT REVISION OF THE EUROPEAN RENEWABLE ENERGY DIRECTIVE 2018/2001**

“There is a growing recognition of the need for alignment of bioenergy policies with the cascading principle of biomass use, with a view to ensuring fair access to the biomass raw material market for the development of innovative, high value-added bio-based solutions and a sustainable circular bioeconomy. When developing support schemes for bioenergy, Member States should therefore take into consideration the available sustainable supply of biomass for energy and non-energy uses and the maintenance of the national forest carbon sinks and ecosystems, the protection of biodiversity as well as the principles of the circular economy and the biomass cascading use, and the waste hierarchy established in Directive 2008/98/EC of the European Parliament and of the Council. However, they should be able to grant support for the production of energy from stumps or roots in the case of waste or residues derived from the implementation of works carried out with the primary objective of nature conservation and landscape management, such as from roadsides. In any event, Member States should avoid promoting the use of quality roundwood for energy except in well-defined circumstances, for example wildfire prevention and salvage logging. In line with the cascading principle, woody biomass should be used according to its highest economic and environmental added value in the following order of priorities: 1) wood-based products, 2) extending their service life, 3) re-use, 4) recycling, 5)

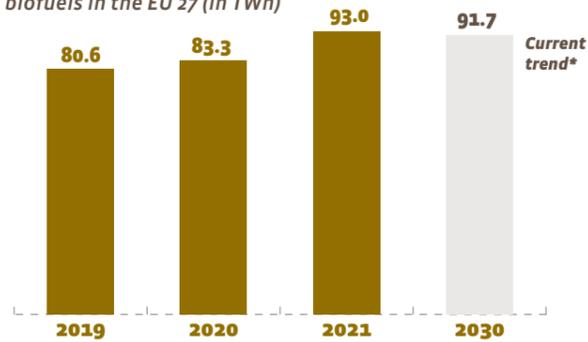
bioenergy and 6) disposal. Where no other use for woody biomass is economically viable or environmentally appropriate, energy recovery helps to reduce energy generation from non-renewable sources. Member States’ support schemes for bioenergy should therefore be directed to such feedstocks for which little market competition exists with the material sectors, and whose sourcing is considered positive for both climate and biodiversity, in order to avoid negative incentives for unsustainable bioenergy pathways, as identified in the JRC report ‘The use of woody biomass for energy production in the EU’<sup>13</sup>. On the other hand, in defining the further implications of the cascading principle, it is necessary to recognise the national specificities, which guide Member States in the design of their support schemes. Waste prevention, reuse and recycling of waste should be the priority option. Member States should avoid creating support schemes which would be counter to targets on treatment of waste and which would lead to the inefficient use of recyclable waste. Moreover, in order to ensure a more efficient use of bioenergy, from 2026 on Member States should not give support anymore to electricity-only plants, unless the installations are in regions with a specific use status as regards their transition away from fossil fuels if they use carbon capture and storage or if the installations cannot be modified in a direction to cogeneration in exceptional justified cases upon approval by the Commission.”

venture, near the Antwerp container port, is the E-Wood Energiecentrale NV biomass cogeneration power plant. This plant, designed to process about 150 000 tonnes of wood waste, will have 20 MW of installed electrical capacity, 7.6 MW of heat extraction capacity and 86 tonnes per hour of steam production capacity. The steam generator is designed as a suspended water tube boiler and will generate live steam at high pressure and high temperature (453°C). A stationary fluidized bed is used as the firing system, which offers clear combustion gas emission reduction advantages. The high pressure steam will be injected into the Ecluse steam network, located in Waasland’s port area to supply steam to chemical plants such as ADPO, Ashland, Monument Chemical, Ineos Phenol and Lanxess.

The Danish group Ørsted has practically completed its transition from coal to biomass over fifteen years (table 5). As these plants have been converted to biomass fuels, the group’s coal consumption has fallen from 6.2 million tonnes in 2006, to 1.1 million tonnes in 2017 and should have been totally curtailed in 2023. However, injunctions served by the Danish authorities to ensure these security

**Graph. n° 3**

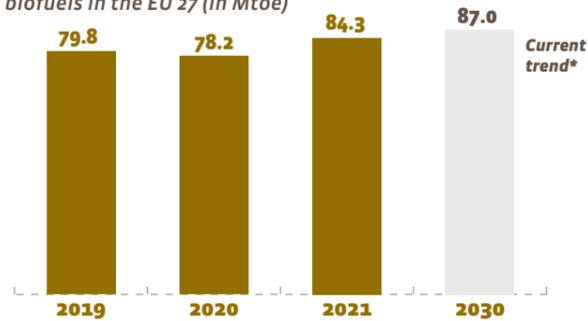
**EurObserv’ER projection of electricity production from solid biofuels in the EU 27 (in TWh)**



Source: EurObserv’ER 2022.

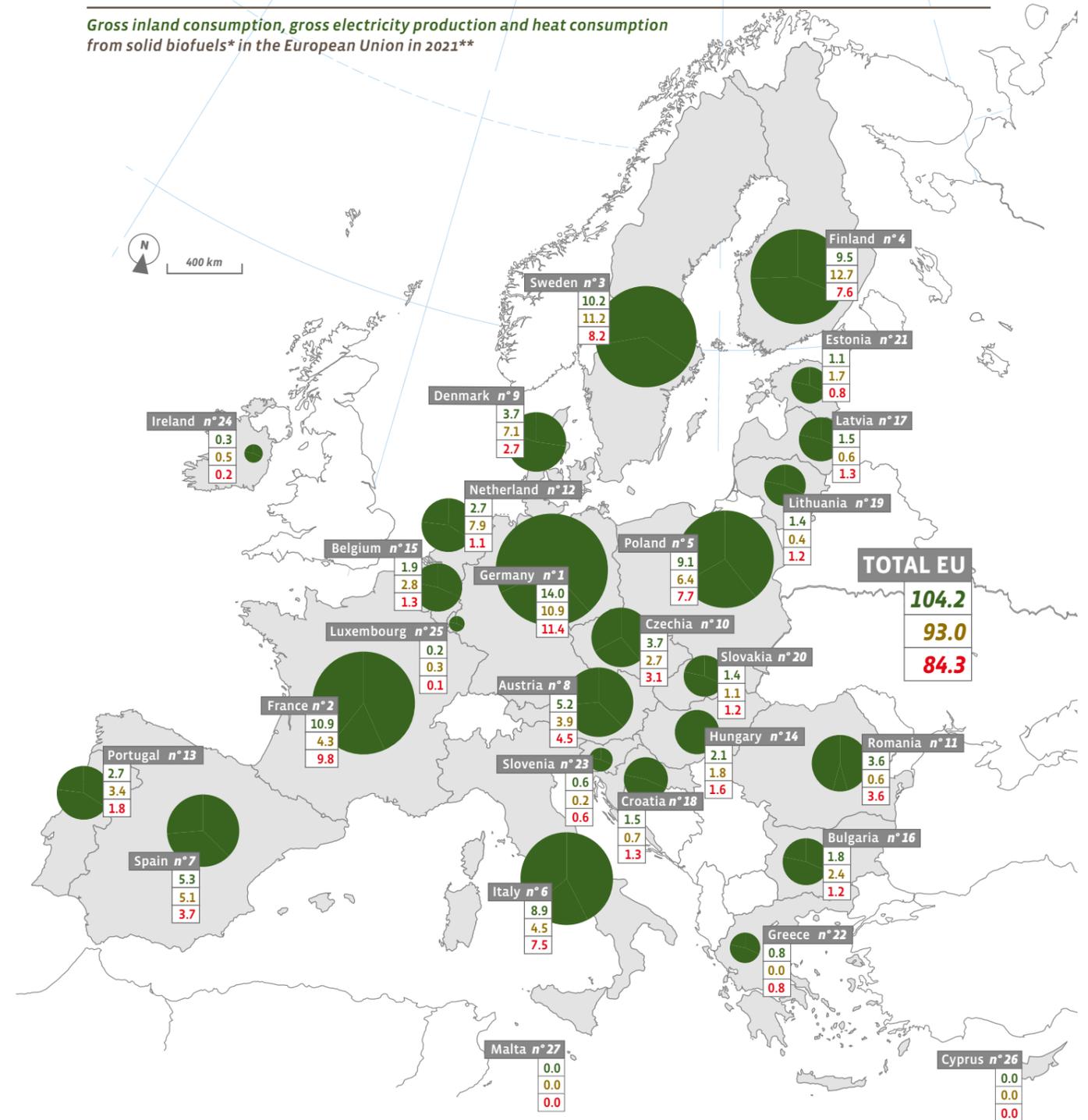
**Graph. n° 4**

**EurObserv’ER projection of heat consumption\* from solid biofuels in the EU 27 (in Mtoe)**



Source: EurObserv’ER 2022. \*Final energy consumption and gross heat production in the transformation sector

**Gross inland consumption, gross electricity production and heat consumption from solid biofuels\* in the European Union in 2021\*\***



of electricity supply in Denmark, have forced Ørsted to postpone its aim to stop using coal by 2024. On 1 October 2022, the Danish authorities directed Ørsted to keep three of its oil- and coal-fired plants running including tranche 3 of the Esbjerg plant and tranche 4 of the Studstrup plant that are mainly coal-fired. Nonetheless, Ørsted insists on its aim to become carbon neutral by 2025.

### IS THE FUTURE OF SOLID BIOFUELS REALLY SUSTAINABLE?

The growing appetite for biomass fuel raises the issues of the sustainability and effects of using these fuels on climate change, and parallel the situation of biofuels which have been at the centre of the European institutions' legal controversies and debates. The European Parliament vote on 14 September 2022 on a set of amendments devoted to biomass as part of the European Renewable Energies Directive

(RED II) revision proposal clearly discourages the Member States from subsidizing the biomass used in power plants and enjoins them to reduce the use of primary wood as renewable energy. The stated objective of these amendments is to limit the amount of biomass that can be burnt and reaffirm the cascading principle (see inset). These amendments, which have yet to be discussed by the European Council, dismayed the sector players. It's all very well for them to remind us that biomass is historically and quantitatively the number 1 renewable energy. Biomass accounts for about 60% of the European Union's renewable energies as a whole and more specifically, solid biomass is the leading renewable sector for heating by a long chalk, be it via direct usage or a heating network. According to Pauline Lucas, Policy Director of Euroheat and Power, bioenergy represents 20% of the energy mix in district heating across

the European Union and this resource is essential if the heating sector is to be decarbonised. Quoted by Euractiv, she warns that limiting biomass use "could really worsen the decarbonisation pathway of our sector" and added that it risked "driving the market away from district heating". The new President of Bioenergy Europe, Christoph Pfemeter, explains in an interview published on the association's website that "The negotiations concerning the Green Deal went into the wrong direction: higher renewable energy and decarbonisation targets without an increase in the use of bioenergy will not work" and that "We need more investment in our sector instead of impractical EU regulations and uncertainties, which are only based on emotions. We need to maximise the potential of renewables and let sustainable biomass flow into the market and yet, at the same time, the EU Parliament is discussing limitations on biomass use.

*The E-Wood Energiecentrale NV plant, constructed near the Antwerp container port, is designed to process about 150 000 tonnes of wood waste, will have 20 MW of installed electrical capacity, 7.6 MW of heat extraction capacity and 86 tonnes per hour of steam production capacity.*



This would lead to shortages, volatile prices and, consequently, to cold homes and increased fossil energy use." The abstract of a lengthy scientific report "The use of woody biomass for energy production in the EU" published in 2021 by the JRC Science (Joint Research centre) for policy report, reminds us that forests are often perceived as being at the nexus of the solutions to the two main environmental crises that are plaguing our planet today: Climate change and biodiversity loss. The EU has conceived the European Green Deal with the specific purpose to mitigate both phenomena. The JRC report attempts to provide a scientific response to several key questions such as: How can we ensure that forest management practices that are beneficial to the climate are also beneficial to biodiversity? The report proposes "win-win" management practices that contribute positively to both; but also identifies "lose-lose" situations whereby damage is done both in terms of the climate and in terms of forest ecosystems. What seems certain is that biomass energy, and solid

biofuels in particular, will remain a pillar of energy transition and for a long time. The main issue that the MEPs and Member States need to address is how much can it contribute? What is the real potential for taking up sustainable biomass with a view to achieving carbon neutrality by 2050? There will be choices to be made between the various energy and non-energy uses and biodiversity protection. Solid biofuels, and biomass in general, cannot be a substitute for all fossil energy uses, so priorities will have to be defined. □

Sources: AGEE-Stat (Germany), GSE (Italy), SDES (France), Ministry of Industry and Trade (Czech Rep.), Danish Energy Agency, Statistics Netherlands, GUS (Poland), Ministry for the Ecological Transition and the Demographical Challenge (Spain), Statistics Austria, SPF Economie (Belgium), Statistics Finland, Statistic Sweden, CRES (Greece), Central Statistical Bureau of Latvia, Statistics Estonia, DGEG (Portugal), NSI (Bulgaria), SEAI (Ireland Rep.), Statistics Lithuania, Statistical Office of the Republic of Slovenia, STATEC (Luxembourg), NSO (Malta), EurObserv'ER, Eurostat early estimate.

The next barometer will be dedicated to wind power.

## Tabl. n° 5

Major European operators of biomass plants in 2021

Operator	Country	Operational capacity (MW)	Biomass and cofiring plants
Ørsted	Denmark	Cofiring plants with biomass conversion 1 672 MWe 2032 MWth (only heat generation capacity based on biomass)	Avedøre 1 (Den), Avedøre 2 (Den), Asnæs 6 (Den), Herning (Den), Skærbæk 3 (Den), Studstrup 3 (Den)
Vattenfall	Sweden	CHP biomass plants and heat plants 77.9 MWe 2395.3 MWth	Lelystad (NL), Märkisches Viertel (GER) and in Sweden Gotland, Vänersborg, Motala, Askersund, Lyvikverket – Ludvika, Craboverket – Fagersta, Idbäckverket – Nyköping, Jordbro, Ekobacken, Fisksätra, Knivsta, Uppsala, Storvreta, Bollmora
Pohjolan Voima	Finland	Multifuel (biomass, peat, fossil) CHP plant 826 MWe 1 344 MWth	Kymin Voima (Fin), Kaukaan Voima (Fin), Alholmens Kraft (Fin), Porin Prosessivoima (Fin), Rauman Biovoima (Fin), Vaskiluodon Voima (Fin)
Fortum	Finland	Multifuel (biomass-coal) CHP 399 MWe, 624 MWth	Multifuel (biomass-coal) CHP: Czeszochowa 5-(Pol), Zabrze (Pol), Naantali (Fin)
RWE	Germany	CHP biomass plant and cofiring plant 655 MWe 350 MWth	Markinch CHP biomass plant (UK) Amer biomass and hard-coal fired power plant (80 % biomass (NL)) RWE Eemshaven (15 % biomass) NL
Engie	France	Biomass plant 205 MWe	Rodenhuize (Bel)

Sources: EurObserv'ER 2022 based on companies annual reports and communication



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