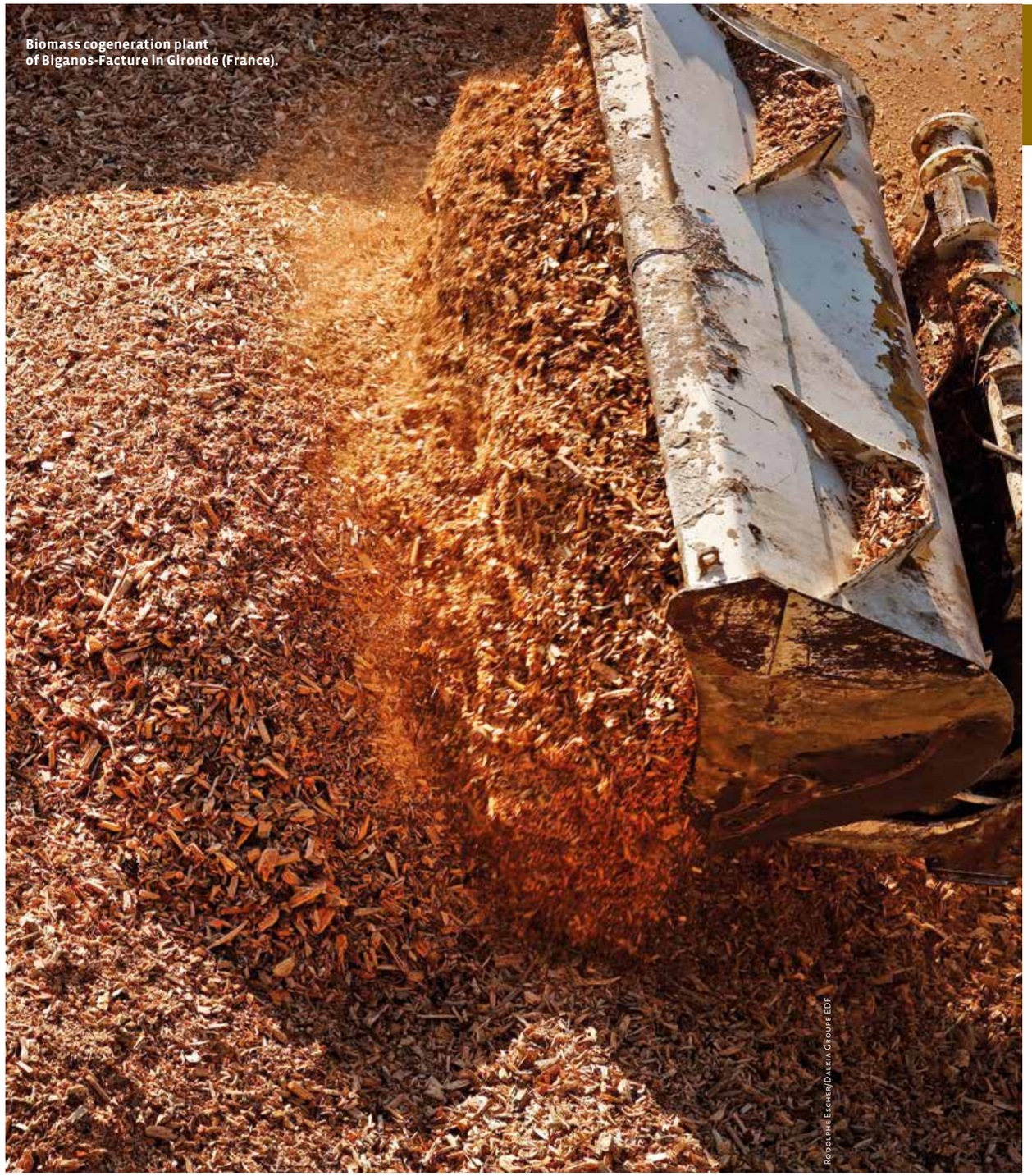


Biomass cogeneration plant
of Biganos-Facture in Gironde (France).

RODOLPHE ESCHER/DALKIA GROUPE EDF

# +3%

*The growth of primary energy consumption from solid biomass in the EU between 2015 and 2016*

# SOLID BIOMASS BAROMETER

*A study carried out by EurObserv'ER.*

EurObserv'ER

**Although 2016 was globally the hottest year on record for the third time running, it was cooler in some key European Union countries, which resulted in additional heating requirements, and thus wood fuel consumption. This trend pushed European Union solid biomass consumption (excluding charcoal) to the 100-Mtoe threshold in 2016, 98.5 Mtoe to be exact, and a rise of 2.9 Mtoe.**

**93.5 TWh**
*The electricity production from solid biomass in the EU in 2016*

**79.1 Mtoe**
*The heat consumption from solid biomass in the EU in 2016*





SOLID BIOMASS BAROMETER – **EUROBSERV'ER** – DECEMBER 2017

Solid biomass is an umbrella term for all solid organic components to be used as fuels. They include wood, wood chips, timber industry by-products (off-cuts, sawdust, etc.) black liquor from the paper industry, wood pellets, straw, bagasse, animal waste and other solid plant residues. Charcoal, derived from solid biomass, is subject to specific statistical treatment and is not included in our study data.

## SOLID BIOMASS REVERTS TO ITS CRUISING SPEED

The succession of mild years and winters in Europe – a quantifiable consequence of climate warming – obfuscates efforts to read the impact of the policies introduced to promote the use of solid biomass in high-performance heating appliances, as heating needs are directly correlated with the average temperature level. According to the World Meteorological Organization (WMO) readings, the last three years – 2014, 2015 and 2016 – have been the hottest on record in Europe… the hottest being 2014, followed by 2015 and 2016, the third hottest. The hapless record for being the hottest year ever registered on the planet goes to 2016, which was amplified by a strong El Niño event, with a record temperature level more than 1.1°C higher than normal for the preindustrial period.

Another factor to be considered is that in a number of Northern European countries logging is a major economic activity, and the European market's requirements for timber products (construction, pulping, furniture, etc.) governs the availability of solid biomass for conversion into energy (wood offcuts, black liquor, conversion of valorisation logging residue). Therefore part of the available biomass energy is linked to the forestry industry's activity level, although another part is totally earmarked for supplying biomass to the energy sector.

Lastly, we need to bear in mind that new studies, mostly new surveys on household wood energy consumption have improved solid biomass consumption monitoring. Incidentally, over and above climate conditions, average home consumption of wood is falling, mainly because of improved appliance performance. Sometimes these surveys lead to significant statistical consolidations over several years.

This preamble considers changes over a longer number of years. Nonetheless, it can be confirmed that solid biomass production and consumption have returned to cruising speed across the European Union. Solid biomass consumption has contracted only twice since the start of the millennium… in 2011 and in 2014. These falls were directly linked to the significant drops in heating needs compared to the previous years 2010 and 2013. The trend over the past two years confirms that solid biomass consumption is picking up. It is caused by an increase in the demand for heat and sustained growth in electricity production, whose progress is less susceptible to the effects of global warming. The reasons why biomass electricity production is enjoying sustained growth are that coal-fired power plants are being converted into biomass power plants and because promoting biomass cogeneration is on national and European agendas.


Wood biomass power station Robin Hood in Roussillon (Isère, France)

Philippe Baduin/Biomasta Rexen

## SIGHTS SET ON 100 MTOE OF BIOMASS CONSUMPTION

According to EurObserv'ER, the 28 European Union member countries' gross consumption of biomass primary energy, measured at 98.5 Mtoe in 2016 **(table 1)** is now at the 100 Mtoe threshold, and equates to a 3.0% (+2.9 Mtoe) rise over 2015. Over the past two years, consumption has increased by 7.3 Mtoe which is a strong sign that consumption has clearly picked up. Solid biomass now carries a lot of weight compared to the other renewable sectors, as it accounts for just under 50% of total renewable energy consumption (211 Mtoe in 2015 – the official figure for 2016 was unavailable at the beginning of December 2017). The production of solid biomass primary energy, equating to solid biomass sourced on European Union soil, has increased by 3.4% – slightly faster – to 95.0 Mtoe (an increase of 3.1 Mtoe between 2015 and 2016). The difference, comprising net imports, mainly consists of wood pellet imports from the USA, Canada or Eastern Europe outside the

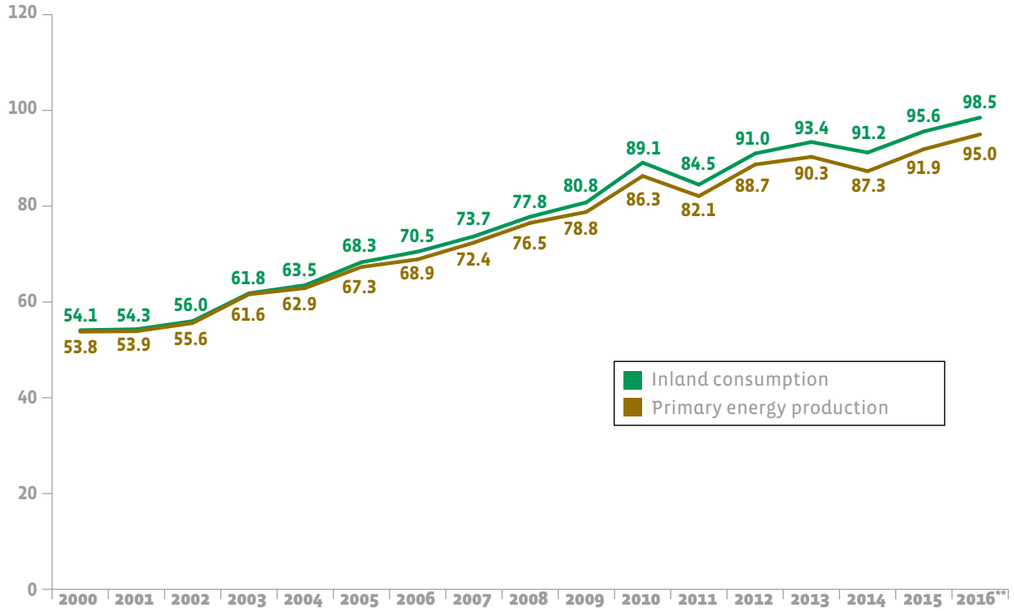
### *Energy recovery at different levels*

*A large proportion of solid biomass is used directly (i.e. unprocessed) by households and other final consumers (industries, etc.) in wood-fuelled heating appliances such as boilers (rated from a few kW to several MW), wood burners or inserts. This direct use of heat is included in a "final energy consumption" (FEC) indicator. This FEC indicator excludes derived heat which was accounted for separately. Derived heat covers the total heat production in heating plants and in combined heat and power plants. It includes the heat used by the auxiliaries of the installation which use hot fluid (space heating, liquid fuel heating, etc.) And losses in the installation/network heat exchanges. For autoproducing entities (= entities generating electricity and/or heat wholly or partially for their own use as an activity which supports their primary activity) the heat used by the undertaking for its own processes is not included.*

*As for the production of electricity, it is generated in thermal power plant, either running exclusively on solid biomass (wood, pellets, wood chips), or in co-combustion more often than not combined with coal. Some thermal power plants operating as CHPs can produce heat and electricity at the same time, which offers better energy efficiency than those that solely produce electricity. This barometer monitors trends in the production and consumption of primary energy and the final use of biomass energy, and differentiates electricity production and derived heat from the transformation sector from direct use by end-users.*

## 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 2000-2013 Eurostat, years 2014, 2015 and 2016 EurObserv'ER.**

European Union (the Ukraine and so on) (see below). Incidentally after steadily rising from 2009 to 2014 (from 1.3 Mtoe in 2008 to 3.9 Mtoe in 2014), the net import balance has tended to slip over the past two years, settling at 3.5 Mtoe in 2016 **(graph. 1).**

EurObserv'ER distinguishes between final energy use originating from solid biomass, namely electricity and heat. Solid biomass heat is broken down by direct use by the final consumer in heating appliances (boilers, wood-burners, inserts, etc.), that account for most of the consumption, to distinguish it from heat supplied by the transformation sector and distributed via heating networks (derived heat) EurObserv'ER reckons that the consumption of heat directly used by final consumers increased by 3.1% (+2.1 Mtoe) in the twelve-month period to achieve 68.8 Mtoe in 2016. Derived heat appears to have increased by 9.5% (0.9 Mtoe), driven by the higher demand for heating. It reached 10.3 Mtoe in 2016 and 61% of the production facilities were cogeneration plants. If these two elements are taken together, **(table 3)** total final energy consumption as biomass heat increased by 3.9% between 2015 and 2016 to 79.1 Mtoe.

European Union solid biomass electricity production **(table 4)** is less vulnerable to vagaries of climate, and more dependent on the policies of certain member countries to develop biomass electricity, either by converting former coal-fired power plants or by developing biomass cogeneration. However, the new European biomass electricity policy, unveiled in the "clean energy" package should severely curb the conversion of coal-fired power plants into biomass power plants not operating as CHPs after 2020. Biomass electricity output across the European Union increased by 3.0% over the twelve months, and rose to 93.5 TWh in 2016 (a 2.8 TWh increase). Electricity production's growth pace is half **(table 2)** what it was between 2014 and 2015 (6.9%, 5.9 TWh), primarily because of less growth in the UK's biomass electricity output. In 2016, France (with increases of 42.8%, 920 GWh), Sweden (with increases of 8.6%, 773 GWh) and Denmark (increases of 24.2%, 679 GWh) were Europe's best performers.

## Tabl. n° 1

***Primary energy production and gross inland consumption of solid biomass* in the European Union in 2015 and 2016 (in Mtoe)***

| | 2015 | | 2016** | |
|---|---|---|---|---|
| Country | Production | Consumption | Production | Consumption |
| Germany | 12.062 | 12.062 | 12.181 | 12.181 |
| France*** | 9.667 | 9.667 | 11.097 | 11.097 |
| Sweden | 9.129 | 9.129 | 9.418 | 9.418 |
| Italy | 7.348 | 8.627 | 7.239 | 8.493 |
| Finland | 7.901 | 7.927 | 8.309 | 8.333 |
| Poland | 6.597 | 6.884 | 6.415 | 6.620 |
| United Kingdom | 3.835 | 6.109 | 3.840 | 6.370 |
| Spain | 5.261 | 5.261 | 5.304 | 5.304 |
| Austria | 4.500 | 4.664 | 4.698 | 4.792 |
| Romania | 3.521 | 3.514 | 3.521 | 3.514 |
| Czech Republic | 2.954 | 2.874 | 2.970 | 2.906 |
| Denmark | 1.631 | 2.584 | 1.588 | 2.793 |
| Hungary | 2.510 | 2.479 | 2.983 | 2.586 |
| Portugal | 2.603 | 2.340 | 2.605 | 2.403 |
| Belgium | 1.171 | 1.942 | 1.292 | 2.058 |
| Latvia | 2.005 | 1.262 | 2.311 | 1.296 |
| Croatia | 1.532 | 1.258 | 1.532 | 1.258 |
| Netherlands | 1.357 | 1.179 | 1.366 | 1.209 |
| Lithuania | 1.205 | 1.204 | 1.200 | 1.206 |
| Bulgaria | 1.160 | 1.035 | 1.120 | 1.056 |
| Estonia | 1.209 | 0.825 | 1.396 | 0.898 |
| Slovakia | 0.890 | 0.879 | 0.890 | 0.879 |
| Greece | 0.952 | 1.013 | 0.797 | 0.855 |
| Slovenia | 0.590 | 0.590 | 0.608 | 0.608 |
| Ireland | 0.201 | 0.228 | 0.226 | 0.271 |
| Luxembourg | 0.057 | 0.066 | 0.063 | 0.069 |
| Cyprus | 0.007 | 0.010 | 0.007 | 0.010 |
| Malta | 0.000 | 0.001 | 0.000 | 0.001 |
| European Union | 91.856 | 95.612 | 94.977 | 98.485 |

**Excluding charcoal. **Estimate. ***Overseas departments not included for France.*
***Source: EurObserv'ER 2017.***

## WOOD PELLET CONSUMPTION FALLING IN THE ELECTRICITY SECTOR

According to EPC (European Pellet Council) data published in the AEBIOM Statistical Report 2017, European Bioenergy Outlook, European Union wood pellet consumption grew at a slower pace than in 2016, rising from 20.8 to 21.7 million tonnes (4.3%). As for European Union output, it remained stable at 14 million tonnes (0.4% less than in 2015), which means that 35.5% of the EU's wood pellet consumption was imported (from the USA, Canada, and also from European countries such as the Ukraine). By the way, this higher wood pellet consumption was solely driven by increased use for heating requirements in the residential (from 8.4 to 9.2 million tonnes) and commercial sectors (from 2.3 to 2.6 million tonnes), while consumption in CHP plants stabilised rising from 2.34 to 2.37 million tonnes and wood pellet consumption in power plants dropped (from 7.8 to 7.5 million tonnes). Looking at the breakdown, 42.6% of European Union wood pellet consumption in 2016 was used in the residential sector (40.4% in 2015), compared to 11.8% in the commercial sector (10.9% in 2015), 10.9% in CHP plants (11.2% in 2015) and 34.7% in power plants (37.5% in 2015). The United Kingdom is still the European Union's biggest wood pellet consumer at 6.9 million tonnes (MT), ahead of Italy (3.2 MT), Denmark (2.2 MT), Germany (2 MT), Sweden (1.6 MT), Belgium (1.3 MT), France (1.2 MT), Austria (0.9 MT) and Finland (0.5 MT).

## Tabl. n° 2

***Gross electricity production from solid biomass* in the European Union in 2015 and 2016** (in TWh)***

| | 2015 | | | 2016* | | |
|---|---|---|---|---|---|---|
| Country | Electricity only plants | CHP Plants | Total electricity | Electricity only plants | CHP Plants | Total electricity |
| United Kingdom | 19.418 | 0.000 | 19.418 | 19.597 | 0.000 | 19.597 |
| Germany | 4.796 | 6.238 | 11.034 | 4.800 | 6.000 | 10.800 |
| Finland | 1.217 | 9.372 | 10.589 | 1.004 | 9.599 | 10.603 |
| Sweden | 0.000 | 8.977 | 8.977 | 0.000 | 9.750 | 9.750 |
| Poland | 1.957 | 7.069 | 9.026 | 1.957 | 7.069 | 9.026 |
| Italy | 2.089 | 1.858 | 3.947 | 2.230 | 1.900 | 4.130 |
| Spain | 3.126 | 0.888 | 4.014 | 3.212 | 0.836 | 4.048 |
| Austria | 1.232 | 2.264 | 3.496 | 0.896 | 2.789 | 3.685 |
| Denmark | 0.000 | 2.803 | 2.803 | 0.000 | 3.481 | 3.481 |
| Belgium | 2.298 | 1.256 | 3.554 | 2.156 | 1.233 | 3.390 |
| France*** | 0.098 | 2.051 | 2.149 | 0.405 | 2.664 | 3.069 |
| Portugal | 0.795 | 1.723 | 2.518 | 0.760 | 1.721 | 2.481 |
| Czech Republic | 0.049 | 2.042 | 2.091 | 0.014 | 2.053 | 2.068 |
| Netherlands | 1.724 | 0.173 | 1.897 | 1.116 | 0.791 | 1.907 |
| Hungary | 1.011 | 0.649 | 1.660 | 1.000 | 0.485 | 1.485 |
| Slovakia | 0.004 | 1.095 | 1.099 | 0.005 | 1.100 | 1.105 |
| Estonia | 0.069 | 0.641 | 0.710 | 0.127 | 0.713 | 0.840 |
| Romania | 0.108 | 0.355 | 0.463 | 0.100 | 0.400 | 0.500 |
| Latvia | 0.000 | 0.378 | 0.378 | 0.000 | 0.427 | 0.427 |
| Ireland | 0.184 | 0.013 | 0.197 | 0.377 | 0.016 | 0.393 |
| Lithuania | 0.000 | 0.318 | 0.318 | 0.000 | 0.262 | 0.262 |
| Bulgaria | 0.003 | 0.149 | 0.152 | 0.003 | 0.170 | 0.173 |
| Slovenia | 0.000 | 0.131 | 0.131 | 0.000 | 0.137 | 0.137 |
| Croatia | 0.000 | 0.089 | 0.089 | 0.000 | 0.100 | 0.100 |
| Luxembourg | 0.000 | 0.024 | 0.024 | 0.000 | 0.025 | 0.025 |
| Greece | 0.001 | 0.000 | 0.001 | 0.005 | 0.000 | 0.005 |
| Cyprus | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Malta | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total EU 28 | 40.179 | 50.556 | 90.735 | 39.764 | 53.721 | 93.486 |

**Excluding charcoal. **Estimate. ***Overseas departments not included for France.* ***Source: EurObserv'ER 2017.***





SOLID BIOMASS BAROMETER – **EUROBSERV'ER** – DECEMBER 2017

Danish biomass plant

NILS ROSENVOLD/DANSK FJERNVARME

## NEWS FROM SOME OF THE PRODUCER COUNTRIES

### French forestry gets its wake-up call

The French Ministry of Ecological and Inclusive Transition's Monitoring and Statistics Directorate (SDES) claims that solid biomass consumption increased dramatically in France between 2015 and 2016. Consumption of solid biomass primary energy increased from 9.7 to 11.1 Mtoe, i.e. by 14.8% (or 1.4 Mtoe). Over the past two years, solid biomass input has increased by 2 Mtoe. According to the SDES, although a new global record was set for heat for the third year running, 2016 was much cooler than 2015 in France, especially in the spring and at the end of the year. The mean temperature in France was 12.6°C in 2016, compared to the previous year's 13.1°C. As a result, heating needs increased and with them wood fuel consumption. Solid biomass electricity output, which in France makes considerable input to heating requirements, leapt from 2.1 to 3.1 TWh (by 42.8%) and the heat produced by the processing sector from 722 to 920 ktoe (by 27.4%). The explanation for this increase is that installed electrical capacity has been stepped up significantly over the past two years, with nett capacity rising from 354 MW in 2014 to 548 MW in 2016 (423 MW in 2015). This additional capacity is the outcome of the CRE tendering policy. Projects completed and commissioned in 2016 worth mentioning include the Sylvania power plant in Brignoles (20 MWe), developed by INOVA, under the 4th CRE Biomass tendering round. The plant will burn 180 000 tonnes of wood per annum (including 140 000 tonnes of logs and wood chips), to generate about 168 000 MWh of green electricity per annum, or enough to cover the consumption of 42 000 households in the Var. Looking at new capacities, we draw attention to the Eurométropole Strasbourg, where the És Group commissioned a new CHP plant, with a 32 MWth boiler fed by forestry residue sourced from forestry operations in the Vosges massifs and the Black Forest. It will generate 70 GWh of electricity per annum (enough to cover the electricity needs of 14 000 homes) and 112 GWh of heat (enough to cover the heating needs of 10 000 homes).

The Observ'ER studies show that despite these good figures, new wood-fuelled heating appliance sales have steadily slipping over the past few years. Right across the board, sales in the wood-fired heating appliance sector (burners, enclosed hearths, inserts, boilers and cooking ranges) have dropped from 528 245 units in 2013 to 346 525 in 2016. Between 2015 and 2016, sales dropped by 5.4% for wood burners (251 200 units sold), by 17.6% for inserts and enclosed hearths (80 700 units sold), by 14.6% boilers (9 720 units sold), while wood-fuelled cooking ranges suffered a tiny 0.1% drop (4 815 units sold). The slump can be partly ascribed to the mild winter that frustrate heating appliance sales generally, and it has been compounded by the persistently very low price of fossil energies (gas and heating oil) that do not encourage investments in renewable energy-fuelled heating appliances. The pellet stove segment held up better thanks to the 2012 thermal regulation that promotes this solution in new-build. Alongside domestic heating, Ademe and the Ministry of the Environment are still promoting biomass heat through the Heat Fund. According to the former, 778 biomass boiler houses received Heat Fund support from 2009–2016 in the collective housing and industrial sectors, resulting in total annual output from biomass of 1.4 million toe, which equates to 5.7 million tonnes of biomass used. All in all, more than 1 000 supported investments were made in biomass. Ademe and the Ministry of the Environment are launching new calls for projects specifically to support companies in producing renewable heat from biomass for industry, agriculture and the private services sector. Investment support for large facilities (>1000 toe p.a.) is through BCIAT (Biomass Heat Industry Agriculture Tertiaire) calls for projects financed by the Heat Fund under Ademe's management. In 2017 they aided 5 new major installations. This resulted in 10 941 toe of annual biomass heat output and cut annual $CO_2$ emissions by 32 000 tonnes, for a total investment sum of 15.3 Mtoe, of which 7.5 Mtoe was directly funded by Ademe. These 5 new installations have the taken the number of completed or on-going facility projects supported by BCIAT calls for projects since 2009 to 109. They account for 574 000 toe of biomass heat output, and potential $CO_2$ emission reduction of 1.7 million tonnes. The combined investment volume injected into them is 669 million euros, including 253 million euros directly by Ademe. The combined annual output of the 62 installations in service is 304 133 toe and this should rise to 450 000 toe in 2018, when the projects under way are completed.

More broadly, Nicolas Hulot, the French

## Tabl. n° 3

*Gross heat production from solid biomass* in the European Union in 2015 and in 2016** (in Mtoe)*
***in the transformation sector****

| | 2015 | | | 2016 | | |
|---|---|---|---|---|---|---|
| Country | Heat only plants | CHP plants | Total Heat | Heat only plants | CHP plants | Total Heat |
| Sweden | 0.704 | 1.614 | 2.318 | 0.711 | 1.765 | 2.477 |
| Finland | 0.599 | 1.012 | 1.612 | 0.668 | 1.092 | 1.760 |
| Denmark | 0.451 | 0.602 | 1.053 | 0.473 | 0.664 | 1.137 |
| France**** | 0.325 | 0.398 | 0.722 | 0.423 | 0.497 | 0.920 |
| Austria | 0.496 | 0.347 | 0.843 | 0.535 | 0.335 | 0.870 |
| Germany | 0.184 | 0.399 | 0.583 | 0.217 | 0.399 | 0.616 |
| Italy | 0.070 | 0.461 | 0.531 | 0.078 | 0.463 | 0.541 |
| Lithuania | 0.346 | 0.100 | 0.445 | 0.392 | 0.095 | 0.487 |
| Poland | 0.029 | 0.268 | 0.297 | 0.030 | 0.289 | 0.319 |
| Estonia | 0.075 | 0.140 | 0.215 | 0.157 | 0.150 | 0.308 |
| Latvia | 0.095 | 0.106 | 0.201 | 0.114 | 0.137 | 0.251 |
| Czech Republic | 0.030 | 0.123 | 0.153 | 0.023 | 0.138 | 0.161 |
| Slovakia | 0.043 | 0.076 | 0.119 | 0.050 | 0.080 | 0.130 |
| Hungary | 0.050 | 0.055 | 0.106 | 0.049 | 0.031 | 0.080 |
| Romania | 0.034 | 0.035 | 0.069 | 0.030 | 0.045 | 0.075 |
| Netherlands | 0.018 | 0.014 | 0.032 | 0.027 | 0.022 | 0.049 |
| Slovenia | 0.008 | 0.018 | 0.027 | 0.009 | 0.019 | 0.028 |
| Croatia | 0.000 | 0.015 | 0.015 | 0.000 | 0.020 | 0.020 |
| Bulgaria | 0.007 | 0.004 | 0.011 | 0.010 | 0.005 | 0.015 |
| Luxembourg | 0.004 | 0.009 | 0.013 | 0.004 | 0.009 | 0.013 |
| Belgium | 0.000 | 0.006 | 0.006 | 0.000 | 0.006 | 0.006 |
| United Kingdom | 0.004 | 0.000 | 0.004 | 0.003 | 0.000 | 0.003 |
| Cyprus | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Greece | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Ireland | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Malta | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Portugal | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Spain | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total EU 28 | 3.572 | 5.802 | 9.375 | 4.004 | 6.262 | 10.265 |

**Excluding charcoal. **Estimate. ***Corresponds to "Derived heat" (see Eurostat definition). **** Overseas departments not included for France.*
***Source: EurObserv'ER 2017.***





SOLID BIOMASS BAROMETER – **EUROBSERV'ER** – DECEMBER 2017

Minister of Ecological and Inclusive Transition unveiled a Climate Plan in July 2017 a couple of months after taking office, which aims to achieve carbon neutrality by the 2050 timeline. The plan's flagship measure is the scheduled, visible acceleration that will increase the carbon price over the five years of the government's mandate. The draft finance bill for 2018 plans to raise the carbon tax to € 44.6/tCO2 for 2018, € 55/tCO2 for 2019, € 65.4/tCO2 for 2020, € 75.8/tCO2 for 2021, and € 86.2/tCO2 for 2022. It should influence the economic actors' choices and stimulate green innovation, in particular by improving energy efficiency and by developing the use of low-carbon energy products.

## Tabl. n° 4

*Heat consumption* from solid biomass* ***in the countries of the European Union in 2015 and 2016*****

| Country | 2015 | Of which direct use by end user | Of derived heat | 2016 | Of which direct use by end user | Of derived heat |
|---|---|---|---|---|---|---|
| France*** | 8.936 | 8.214 | 0.722 | 9.822 | 8.902 | 0.920 |
| Germany | 9.253 | 8.670 | 0.583 | 9.573 | 8.957 | 0.616 |
| Sweden | 7.689 | 5.371 | 2.318 | 7.852 | 5.376 | 2.477 |
| Italy | 7.380 | 6.850 | 0.531 | 7.174 | 6.633 | 0.541 |
| Finland | 6.432 | 4.820 | 1.612 | 6.897 | 5.137 | 1.760 |
| Poland | 4.896 | 4.599 | 0.297 | 5.170 | 4.851 | 0.319 |
| Austria | 3.826 | 2.983 | 0.843 | 4.085 | 3.215 | 0.870 |
| Spain | 3.927 | 3.927 | 0.000 | 3.982 | 3.982 | 0.000 |
| Romania | 3.375 | 3.306 | 0.069 | 3.381 | 3.306 | 0.075 |
| United Kingdom | 2.606 | 2.602 | 0.004 | 2.864 | 2.861 | 0.003 |
| Czech Republic | 2.405 | 2.251 | 0.153 | 2.438 | 2.278 | 0.161 |
| Denmark | 2.222 | 1.169 | 1.053 | 2.347 | 1.210 | 1.137 |
| Hungary | 2.101 | 1.996 | 0.106 | 2.119 | 2.039 | 0.080 |
| Portugal | 1.720 | 1.720 | 0.000 | 1.774 | 1.774 | 0.000 |
| Croatia | 1.207 | 1.192 | 0.015 | 1.320 | 1.300 | 0.020 |
| Belgium | 1.190 | 1.184 | 0.006 | 1.318 | 1.312 | 0.006 |
| Latvia | 1.104 | 0.903 | 0.201 | 1.118 | 0.866 | 0.251 |
| Lithuania | 1.065 | 0.620 | 0.445 | 1.109 | 0.621 | 0.487 |
| Bulgaria | 1.003 | 0.992 | 0.011 | 1.006 | 0.991 | 0.015 |
| Greece | 1.010 | 1.010 | 0.000 | 0.849 | 0.849 | 0.000 |
| Netherlands | 0.685 | 0.653 | 0.032 | 0.712 | 0.662 | 0.049 |
| Estonia | 0.692 | 0.477 | 0.215 | 0.711 | 0.404 | 0.308 |
| Slovakia | 0.564 | 0.445 | 0.119 | 0.630 | 0.500 | 0.130 |
| Slovenia | 0.565 | 0.538 | 0.027 | 0.585 | 0.556 | 0.028 |
| Ireland | 0.193 | 0.193 | 0.000 | 0.192 | 0.192 | 0.000 |
| Luxembourg | 0.060 | 0.047 | 0.013 | 0.063 | 0.050 | 0.013 |
| Cyprus | 0.008 | 0.008 | 0.000 | 0.008 | 0.008 | 0.000 |
| Malta | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 0.000 |
| Total EU 28 | 76.115 | 66.741 | 9.375 | 79.099 | 68.834 | 10.265 |

**Consumption of the end user (either as heat sold by the district heating or self-consumed. either as fuels for the production of heat and cold). **Estimate. ***Overseas departments not included for France.* ***Source: EurObserv'ER 2017.***

### Forests – the keystone of Finland's climate policy…

Finland's renewable energy consumption made a new record in 2016. Statistics Finland data shows that solid biomass consumption crossed the 8.3 Mtoe threshold in 2016 (5.1% increase over 2015), which is the country's highest ever solid biomass consumption level. The country is by far the largest consumer of solid biomass per capita with 1.5 toe **(graph 2)**.The renewable energy share of final energy consumption has already been put at about 34% in 2016, which is very close to its 2020 target. The main reason for this increase has been the surge in its timber industry activity, resulting in a higher amount of wood residue, by-products and black liquor being turned into energy.

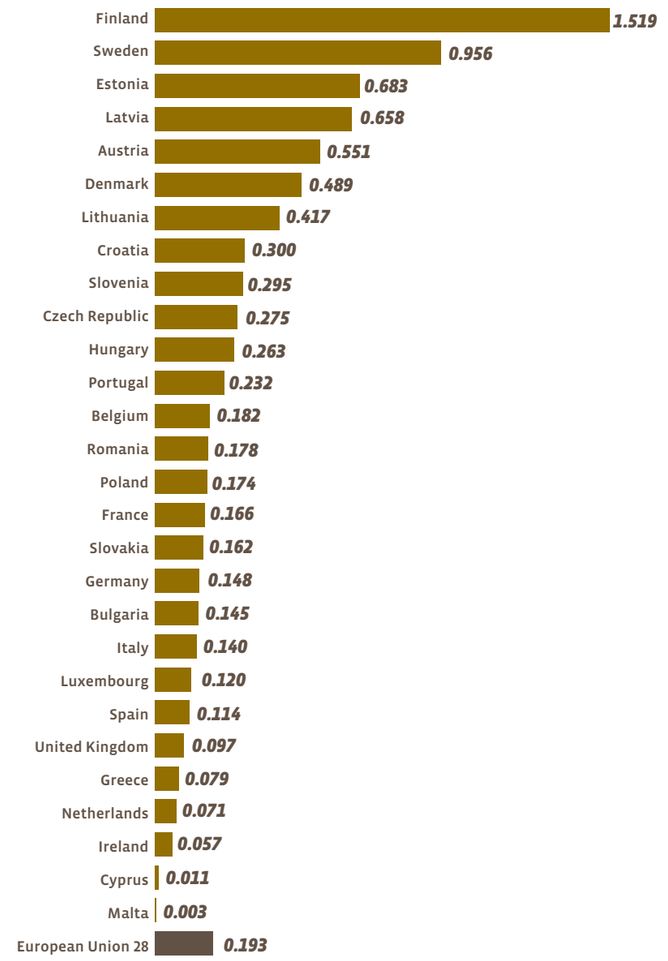
Solid biomass consumption will be boosted when the Finnish climate policy is implemented as part and parcel of the "national energy and climate strategy". In the previous edition of this strategy document, the country had already set ambitious targets such as reducing GHG emissions by at least 80% from its 1990 level by 2050, and in time becoming a carbon-neutral society. The latest edition, published in November 2016, revolves around the following orientations: pulling out of coal for generating electricity by 2030, reducing oil imports in the 2020s to 50% of its 2005 level, reforming the renewable energy subsidy system so that the renewable energies share of final energy consumption reaches 50% in the 2020s. Special attention is given to preserving carbon sinks – the long-term growth and carbon absorption capacity of forests must be boosted, including by encouraging the afforestation of treeless areas by reducing logging for urban infrastructure construction work. To achieve these aims, Finland plans to introduce energy taxation likely to encourage the use of solid forestry biomass and logging by-products for the country's CHP plants and the many boiler houses suppling district heating networks.

### … and that of Sweden

Statistics Sweden claims that solid biomass production and consumption (the figures are the same) increased for the second year running. In 2016, consumption was put at 9.4 Mtoe (3.2% more than in 2015), close to its 2012 production record (9.6 Mtoe). This increase firstly boosted electricity output, which put on 773 GWh, to reach 9.75 TWh (8.6% more than in 2015). The reason for this increase is not really down to broad expansion of the CHP plant production capacities (all Sweden's biomass electricity is generated in CHP plants), whose nett capacity has risen from 3 729 MW in 2014 to 3 760 MW in 2016 (3 700 MW in 2015), but more because of increased demand made of its existing capacities. The weather in 2016 is partly responsible for this accrued demand made of biomass CHP plants, as poor wind and rainfall conditions drastically reduced the country's wind power and hydropower output. At the same time, heat from the processing sector (heating networks), the bulk of which originates from CHP plants (71.3% of the total in 2016) has been steadily rising in Sweden. It increased by 6.8% in 2016 to achieve 2.5 Mtoe… a level unmatched anywhere in the EU.

## Graph. 2

*Gross energy consumption of solid biomass by toe per inhab* ***in the European Union in 2016****




** Estimate.* ***Source: EurObserv'ER 2017.***





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Sweden’s news has been marked by a climate policy bill voted in by its MPs on 15 June 2017. The law will be enacted on 1 January 2018 and enshrines carbon neutrality by 2045 as its main aim, followed by negative emissions across Sweden. Thus domestic emissions will have to be reduced dramatically, in the sectors covered by European Union regulations on the distribution of responsibilities… by 63% between 1990 and 2030 and 75% between 1990 and 2040. The bill stipulates that part of the emission reductions could be covered by additional measures, such as strengthening the forests as carbon sinks (by extending the forested areas and improving its management) and setting up climate projects abroad. These measures could be used to achieve a maximum of 8 and 2 percentage points of its emission reduction goals by 2030 and 2040 respectively. Sweden’s forests should both contribute more to its energy requirements while strengthening its carbon sink role. The government will have to be held to account on its climate policy and will set quantified targets for each GHG-emitting sector (industry, agriculture, transports, etc.).

## Biomass electricity growth in the UK slows down

According to the BEIS (Department for Business, Energy & Industrial Strategy), solid biomass consumption increased at a much slower pace than in previous years. It rose from 6.1 to 6.4 Mtoe in 2016 (4.3% more than in 2015), compared to 25.3% between 2014 and 2015. Domestic British output remained more or less stable at 3.8 Mtoe; the difference is explained by imports primarily of North American wood pellets.

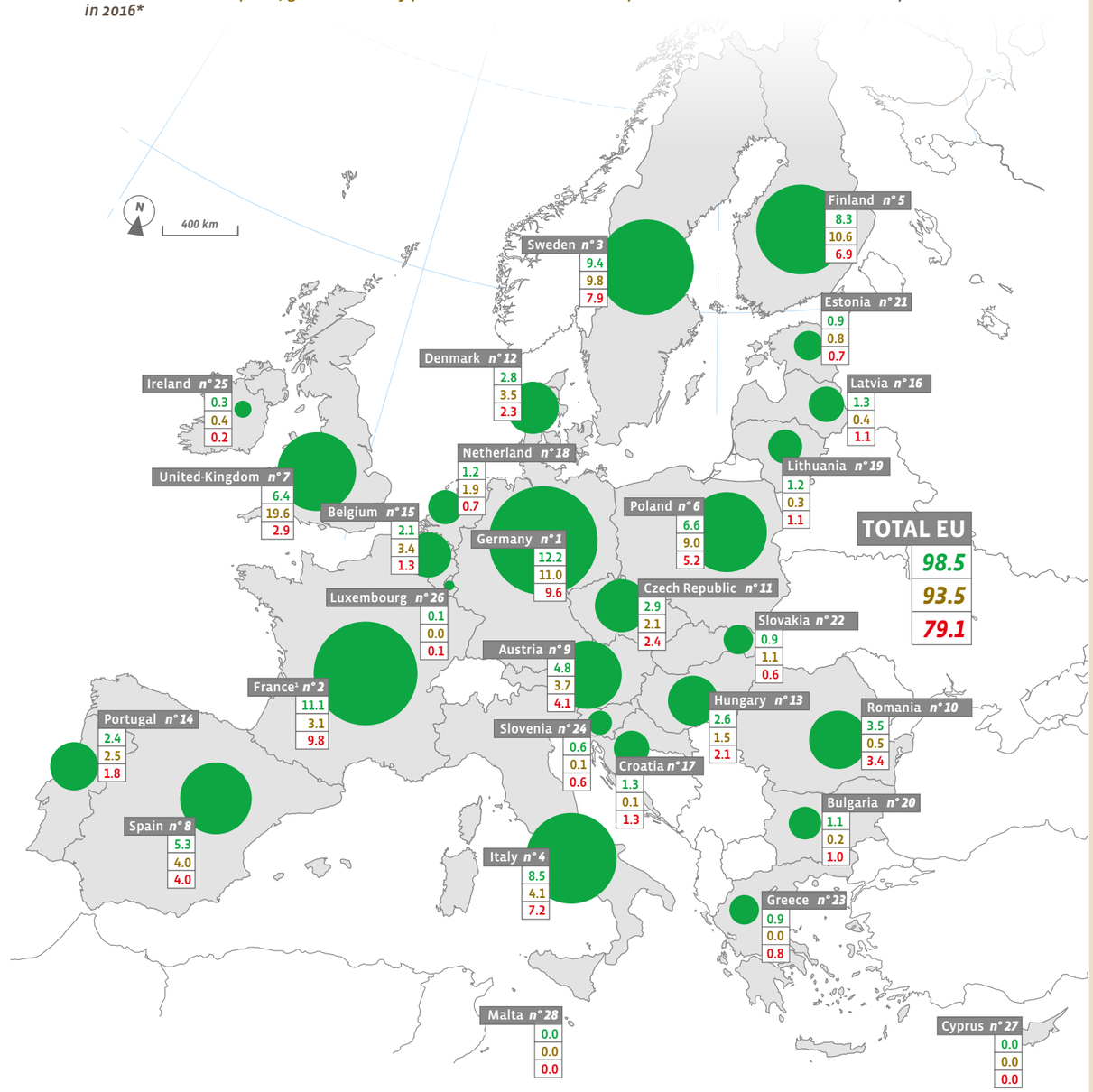
This slower-paced growth in consumption is borne out by the solid biomass electricity output figures. While the UK is still the European Union’s top solid biomass electricity producer with 19.6 TWh, output increased by only 0.9% between 2015 and 2016 (by 40.5% the previous year). This growth in output is disproportionate to the increase in installed power plant capacity, which rose from 2 738 MW in 2015 to 2 993 MW (9.3%). The Brigg and Snetterton straw-fired power plants account for 84 MW of the additional 255 MW. The reason for the lower growth in biomass electricity output was caused by maintenance work at the Drax power plant.

Domestic wood consumption accounts for a significant proportion of renewable heat consumption. In the UK this proportion is put at 50% of the renewable heat produced in the country. In 2015, the BEIS commissioned a major study to get a better grasp of household wood energy consumption. Its results suggest that the use of wood energy had previously been underestimated by a factor of three. It confirms that inserts and enclosed hearths are the main heating systems and that wood is the main heating feedstock for 12% of users. The study also suggests that a large amount of the wood consumed is informally sourced from farms, grounds maintenance, self-supply and using wood off-cuts. Appliances





***Gross inland consumption, gross electricity production and heat consumption** from solid biomass in the European Union in 2016**




***Key***

11,1 Gross inland consumption of solid biomass in the European Union in 2016* (in Mtoe).

3,1 Gross electricity production from solid biomass in the European Union in 2016* (in TWh).

9,8 Heat consumption from solid biomass in the European Union in 2016* (in Mtoe).

** Estimate. ¹ Overseas departments not included.* ***Source: EurObserv’ER 2017.***


burning wood pellets or wood chips are eligible for the RHI, but wood pellets or wood chips account for only about 4% of all wood used in domestic heating.

### A BALANCE NEEDS TO BE FOUND BETWEEN INDUSTRIAL DEVELOPMENT AND CONTROLLING ENVIRONMENTAL IMPACTS

The European biomass landscape is mixed, comprising manufacturers, service providers and component suppliers for the various biomass energy conversion methods, in the residential and commercial, industrial heating, electricity and transport sectors.
A number of European countries are pursuing policies to substitute part of their coal consumption by solid biomass fuel. A point in case is the United Kingdom, which has declared that it wants to close all coal-fired power plants by 2025. This declaration has had an impact on the utility companies and primarily on Drax. In the first half of 2017, the group reported a pre-tax loss of £ 83m, attributed to the write-down of its remaining coal-fired sites. In the wake of the announcement the group's share price slid by 4.25%. The group did not wait for the summer of 2017 to react and make a fundamental shift. As early as 2013, Drax converted one of its power plants to biomass, and in 2017, 68% of the energy it produced will have be from wood pellet feedstock. The group's last 3 coal-fired sites will be converted to run on biomass or gas.
Other major structures are following suit in the UK. For example the Brigg and Snetterton projects were commissioned in 2016, developed by the Fichtner engineering consultancy. The two power plants, Brigg, with a capacity of 40 MW, and Snetterton, with 44 MW, are based in Lincolnshire and Norfolk and both use wheat straw as their feedstock, which can be substituted by wood chips or miscanthus. They produce enough energy to supply almost 153 000 homes. The project went through a refinancing phase in October 2017, to accompany its commissioning. Copenhagen Infrastructure Partners (CIP) provided £ 250M in pension funds, raised through a number of financial institutes such as the Royal Bank of Scotland, Investec and Aviva Investors. This investment profile offers the attraction of safe, regular and long-term returns to institutional investors seeking to limit risks.
These large facilities have their detractors because of the vast amounts of raw materials involved. Drax, for example, sources its wood pellets from the USA. Not only does that expose the company to potential currency exchange rate risks (although it has hedged against that risk by entering fixed-rate contracts over five years), but it also raises the issue of the environmental impact of this value chain.
In France, the Gardanne power plant has had trouble gaining acceptance. This large, 150-MW power plant successfully bid to convert a coal-fired power plant to biomass. In 2024, it will use 850 000 tonnes of wood at a 100% utilisation rate, half of which will come from logging, the rest sourced from pruning waste and wood waste. In November 2012 it was awarded an operating permit, but several environmental associations together with the region's national parks mounted an appeal against it. They were concerned that in view of the amount of timber to be extracted the project's impact on the local environment had been underestimated. They were heard by the court which cancelled the power plant's operating permit on 8 June 2017. Notwithstanding, the following day, 9 June, the region's Prefect signed a temporary order enabling the power plant to pursue operations. The company has nine months from that date onwards to reapply for an operating permit. Since then, two of the parks have withdrawn their complaint, ceding to political pressure that threatened to reduce or revoke their subsidies.
Tension between environmentalists and biomass electricity production sites can be found more or less all over Europe. The reason is because the forests pay the dual role of carbon sink and raw materials source, so in order to optimise both these aspects, equilibrium must prevail. Furthermore, increasing numbers of people are becoming concerned about timber extraction's impact on the ecosystem, fauna and flora, and consequently, studies are being conducted on the issue. The VTT Technical Research Centre, in Finland, has addressed the issue. It guides





## Tabl. n° 5

*Major European operators* ***of biomass plants in 2016***

| Operator | Country | Operational capacity (MW) | Production (MWh) |
|---|---|---|---|
| Drax Group | United-kingdom | n.c. | 12 700 |
| Pohjolan Volma | Finland | 687 MW (elec)<br>1 198 MW (heat) | n.c. |
| E.on | Germany | 468 MW | n.c. |
| Fortum | Finland | 592 MW(elec)<br>477 MW (heat) | n.c. |
| Vattenfall | Sweden | 281 MW | 800 |
| Engie | France | 285 MW | 1 750 |
| Dalkia | France | 1,8 M tons of wood used | n.c. |
| Zellstoff Stendal | Germany | 135 MW | n.c. |
| Kaukaan Volma Oy | Finland | 125 MW (elec)<br>110 MW (heat) | n.c. |

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

the deployment of new industrial biomass value chains and offers industrialists its assessment services.
At the same time, biomass-energy seems more relevant when it is incorporated into a local energy scheme that produces electricity and heat distributed across a network. Proof of this is shown in France, where the heating network roll-out policy is driven by regular calls for tender. Thus on 15 December 2017 the eighth renewable heat bidding session for the Paris Basin closed. Engie commissioned a biomass boiler plant at Saint-Denis, France, during the summer of 2017, which supplies the country's third most extensive urban heating network. It demonstrates how turnarounds can be made, as this 60-km long network was supplied 75% by coal, 20% by heavy fuel oil and 5% by gas in 2000. Nowadays now it is fuelled 50% by biomass and 50% by gas. Solutions of this type are popping up all over Europe. Veolia has commissioned a very large-scale 100% biomass heating network in the city of Pécs, Hungary. Lastly, in 2017, Dong Energy finished converting its Skaerbaek site in Denmark from gas to biomass. It can generate 95 MW of electricity and 320 MW of heat, injected into a heating network.
The logical successor to cogeneration has already arrived in the form of trigeneration, which combines the production of electricity, heat and cooling. The city of Stockholm has the benefit of a plant installed by Fortum Värme that uses forestry biomass as its fuel and thus increased the city's overall biomass consumption from 45% to 70%. Another facility of this type, called Kiowatt, which was constructed in Luxembourg, through a partnership between LuxEnergie and the François Group, has been running since 2013. The plant uses 35 000 tonnes of wood and wood off-cuts per annum to produce 21 GWh of electricity and 93 GWh of heat. The site's cooling plant has a capacity of 5 GW. The site also produces wood pellets for sale and export.

### *2030… A BIG INCREASE IN SOLID BIOMASS CONTRIBUTION IS POSSIBLE*

All things considered, 2016 was positive for expanding the solid biomass sectors as it consolidated the previous year's pick-up in consumption despite the fact that heating requirements have dwindled in recent years. Solid biomass heat consumption is ahead of the trajectory set out for it in the European Union National Renewable Energy Action Plans (NREAP)…. with 82.6 Mtoe, including 3.5 Mtoe supplied by the organic part of municipal waste incineration **(graph 3)**.
The reason for this important positive difference is that the member countries have made efforts to develop solid biomass heat, for individual, collective and industrial use and have also been assisted in this by initially having underestimated their consumption. We note that since the NREAP plans were published in 2010, many countries have revised their estimates of biomass heat consumption upwards and retroactively, primarily on the strength of more detailed surveys of household wood energy consumption.
The forthcoming European directive target dates for 2020 generally encourage the countries to improve their appraisals of solid biomass consumption and the impacts of their energy policies. These statistical consolidations are usually revised upwards up and have had a positive impact on the renewable energy trajectory of the countries in question.
Turning to electricity production, the countries with major forestry industries are politically committed to keeping up their major drives to develop biomass

*AEBIOM, in its "AEBIOM Statistical report 2017 – European Bioenergy outlook" publication, also set itself a forward-looking target for the 2020 timeline shared by all the biomass heat sectors, differentiating the residential, industrial and derived heat segments. In the case of the residential segment, AEBIOM, based its projections on Eurostat data, and forecasts an increase in heat consumption by 2020 compared to 2015 based on two scenarios ranging from 43% (i.e. 60 569 ktoe), if the winter temperatures are in line with 1980–1999 and 39% (i.e. 58 829 ktoe) if they fall in line with the winter temperatures of 2000-2016. As for derived heat, it should increase by 24% over the 2015 figure to reach 15 830 ktoe and biomass heat in industry would only increase by 4% to reach 22 203 ktoe in 2020. Taken together, forecast heat consumption will be 98.6–96.9 Mtoe.*

*AEBIOM points out that these scenarios factor in elements such as the change in winter temperatures for the residential segment, variables such as the price of gas and heating oil for derived heat, and in the industrial segment, the expected economic development in the paper and pulp sector. It also points out that biomass promotion policies and taxes will be lead drivers for biomass heat. AEBIOM carried out the same exercise on bioenergy electricity (all sectors) and forecasts that output in 2020 will have grown by 53% compared to 2015, which equates to 23 370 ktoe (271.8 TWh). Unfortunately the study provides no detail by biomass energy type (solid biomass, biogas, renewable municipal waste and liquid biofuel) for 2020, bearing in mind that in 2015, the solid biomass share accounted for just over half of the total. According to EurObserv'ER, this forecast is in line with a high scenario and could take a few more years to bring off.*

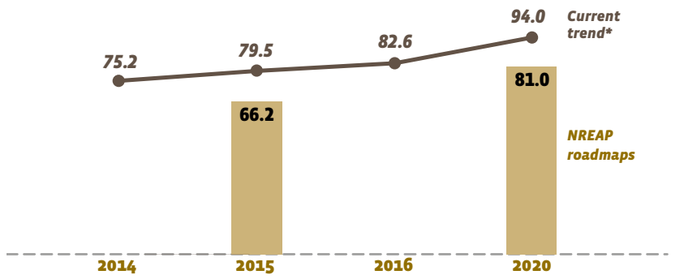
cogeneration **(graph 4)** and to making better use of their forestry potential (by implementing Climate Plans), which should also result in steady growth. It is difficult to make accurate forecasts for 2020 because a number of operators have or are in the process of converting their thermal power plants so that they can be relatively flexible in their use of feedstocks. Biomass electricity production may well accelerate over the last two to three years of the decade, as AEBIOM projections suggest (see box). The forecast of 130 TWh made by EurObserv'ER (which includes household waste-to-energy recovery) is more conservative and is based on the current growth trend. As it stands, the trend is too weak to achieve the initial NREAP solid biomass electricity deployment targets.

The development pace for the forthcoming years and the longer term after 2020 will primarily depend on new measures to implement energy policies in line with the member countries' Climate Plans, and primarily those that aim to gradually levy heavy carbon taxes. Many experts believe that solid biomass is most likely to increase its contribution significantly in the forthcoming years and decades with the same forested area, through more rational exploitation and the development of agroforestry, a farming practice that consists of replanting trees in the middle of crops and also on restoring hedgerows. This development will have to be controlled to ensure that the biodiversity of forest environments remains unchanged, to qualify as sustainable, with impacts on forestry management methods and the tree species chosen for planting. From 2020 to 2030, solid biomass should mainly be used for heating buildings and to a lesser extent for producing methane by gasification for injection into the natural gas grid – a technology that will become more profitable as the rate of carbon tax rises.

At the same time it will depend on the establishment or otherwise, of a more ambitious development framework than the current compromise set by the European Council in 2014 and taken up in the European Commission's current Climate & Energy Package. In 28 November 2017, The European Parliament sent a strong signal to the European Council and the European Commission when the ITRE committee (on industry, research and energy), responsible for revising the renewable energies directive and the energy efficiency directive, made new proposals, namely a 35% minimum target for renewable energies in total

## Graph. n° 3

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

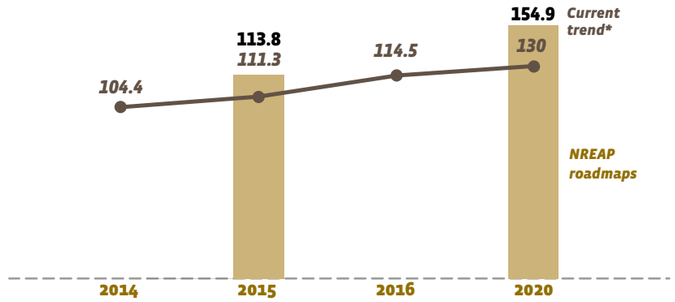



*These data include an estimate of the renewable heat from incineration plants of municipal waste (waste to energy plants).* ***Source: EurObserv'ER 2017.***



## Graph. n° 4

*Comparison of the current trend of elrctricity 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 2017.***

European Union energy consumption by 2030, without having reached agreement on the implementation of binding national targets. Furthermore it adopted a 10% "flexibility" margin (in its proposal) in the compromise amendments. This means that the Member States can fail to achieve their targets in "exceptional and duly justified circumstances". Just over a week later, on 7 December 2017, the European Parliament industry and energy (ITRE) and environment (ENVI) committees collectively voted for their stand on the Union's energy governance regulation, which defines how the EU Member States should achieve the EU's climate and energy targets for 2030, including the common binding renewable energies target. The MEPs passed provisions that include demanding the Member States to present their national energy and climate plans before 1 June 2019, which is six months before the European Council gives its opinion. The MEPs also asked that the deployment of renewable energy should follow straight-line trajectories and be monitored every two years with regard to the interim targets. □

*Sources: Statistics Austria, FPS Economy (Belgium), NSI (Bulgaria), Ministry of industry and trade (Czech Rep.), ENS (Denmark), Statitics Estonia, Statistics Finland, SDES (France), AGEEStat (Germany), CRES (Grèce), University of Miskolc (Hungary), SEAI (Irlande Rep.), GSE (Italy), Ministry of economic development (Italy), Central Statistical Bureau of Latvia, Statistics Lithuania, STATEC (Luxembourg), NSO (Malta), Statistics Netherlands, GUS (Poland), DGEG (Portugal), Statistical office RS (Slovenia), IDAE (Spain), BEIS (United Kingdom), Statistics Sweden, EurObserv'ER.*

*The next barometer will cover wind power*

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