



Financial support for electricity generation & CHP from solid Biomass

Final Report

Contract details

Natural Resources Defense Council

Financial support for electricity generation and CHP from solid biomass

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Glossary

Terms

Biomass - organic material of non-fossil origin, including much organic waste - can be converted into bioenergy through combustion, either directly or via derived products.

Solid biomass - biomass used in the generation of bioenergy. In energy statistics there are five types of solid biomass, namely fuelwood, black liquor, bagasse, animal waste and vegetal waste.

Combined heat and Power (CHP) - in these electricity generating installations the waste heat is collected and utilized to serve heat demand.

Feed-in tariff (FIT) - This is a form of operational support where energy producers receive a fixed amount of money per unit of energy produced, regardless of energy market process.

Feed-in premium (FIP) - This is a form of operational support where the subsidy is given in top of the market price. Fixed FIPs provide a fixed amount of subsidy on top of the market price, whereas the level of sliding FIPs depends on the level of the market price. The height of the FIP is then often the difference between the costs of energy production minus the market price.

Green certificates - These are certificates that are awarded by government agencies to producers of renewable energy for every MWh of renewable energy they produced. These certificates can then be used to sell green energy to end-users, either directly or by selling these certificates to energy retail companies. Green certificates are often combined with renewable energy obligations, which means that energy companies should have a minimum level of renewable energy, which they can attain by either receiving (through RE production) or buying certificates.

Energy Units

Petajoule (PJ) - 10^{15} joules or 1 million billion joules

Gigawatthour (GWh) - 1 million kWh

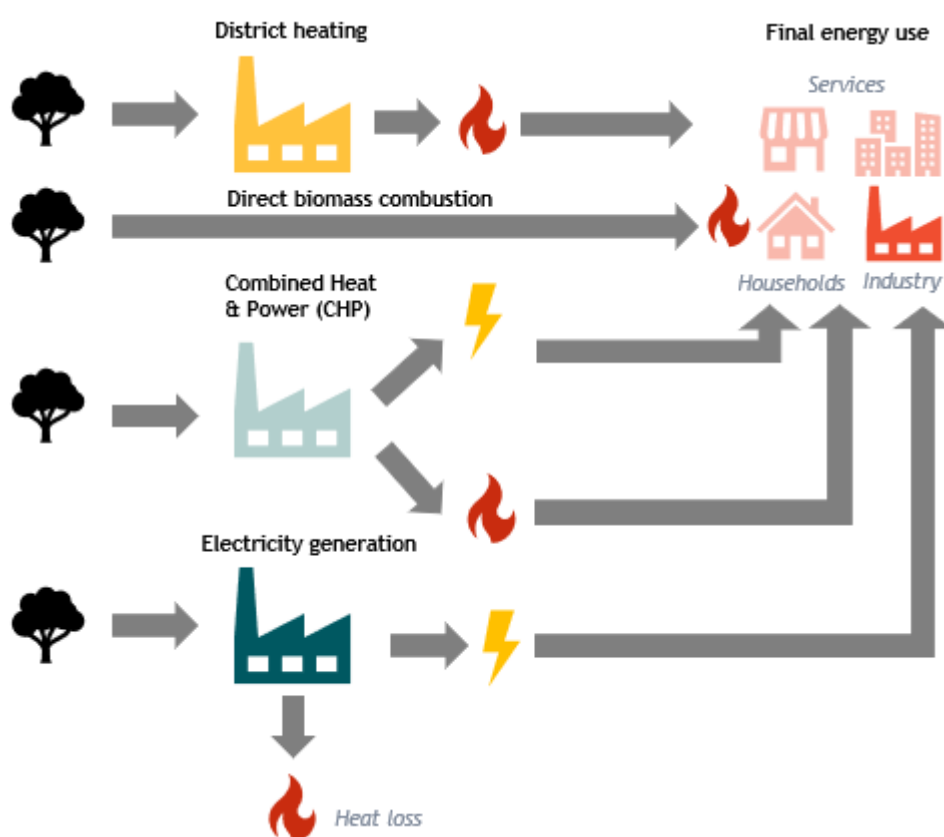
Terawatthour (TWh) - 1 billion kWh

Executive summary

Introduction

This study carried out research in 15 European countries¹ to inventory the subsidies provided to solid biomass production, investment and demand. The subsidies covered included tax expenditures (exemptions and reductions, tax allowances, tax credits and others), direct transfers (grants, soft loans) and indirect transfers (feed-in tariffs, feed-in premiums, renewable energy quotas, tradeable certificates and others). The work covered the period 2015-2018 and focused on biomass used for electricity or heat with figure 0-1 summarizing the scope.

Figure 0-1 Illustration of the different energy uses of solid biomass considered in this study



Biomass subsidies increasing

The compilation of subsidy data across the 15 selected countries of interest leads to a total of 46 policy instruments with a total value of just over €6.5 billion in 2017 (table 0-1). Over the period 2015-2017 the total value of the subsidies provided to the use of solid biomass for energy purposes increased. The lion's share of this growth came from Italy (+607 M EUR), the UK (+255 M EUR) and the Netherlands (+88 M EUR). A large (-57 M EUR) decrease took place in Poland, relating to a reduction in the prices of green certificates. In 2018, the total amount of subsidies for those for which data is available shows a small decline from 2017 levels. However, when data from the other countries is available we expect the total to have grown again.

¹ the United Kingdom (UK), Germany (DE), The Netherlands (NL), Denmark (DK), France (FR), Italy (IT), Spain (ES), Poland (PL), Sweden (SE), Finland (FI), Portugal (PT), Belgium (BE), Austria (AT), Ireland (IE), Slovakia (SK)

Table 0-1 Summary of bioenergy subsidies 2015-2018, EUR million

Country	Bioenergy subsidies (EUR million)				
	2015	2016	2017	2018	Change 2015-2018
Group 1 (2015-2018 data)					
Germany	1 724	1 746	1 768	1 733	0%
Spain	781	948	802	864	11%
Italy	242	740	887	849	251%
Austria	283	275	277	260	-8%
Portugal	86	80	86	77	-11%
Finland	79	47	46	35	-56%
Slovakia	52	67	72	72	40%
Denmark	60	59	87	91	44.5%
Sweden	60	53	39	50	-16%
Sub-total	3 368	4 015	4 064	4 031	19.7%
Group 2 (2015-2017 data)					Change 2015-2017
United Kingdom	1 384	1 399	1 639		18%
Belgium	279	309	338		21%
France	256	319	322		26%
The Netherlands	29	57	117		309%
Poland	79	39	22		-73%
Ireland	4	9	16		343%
Sub-total	2 031	2 132	2 454		20.9%
Total (Group 1 plus Group 2)	5 399	6 147	6 518		20.7%

Note: Some sub-totals and totals may differ from the sum of individual values due to rounding

Biomass subsidies as a share of total renewable energy subsidies

In seven of the case study countries subsidies for energy from solid biomass represent less than 10% of the total financial support given to renewables, in only three countries does it account for more than 20% of the total support given to renewables. There is generally a clear correlation between countries with high share of the renewables support going to biomass and the share of biomass in gross electricity generation. For the use of solid biomass in final energy consumption the relation with government subsidies seems to be less pronounced. It should be noted though, that in many countries the use of biomass for heating is less heavily taxed than the use of other energy carriers, and in many cases no energy taxes apply at all.

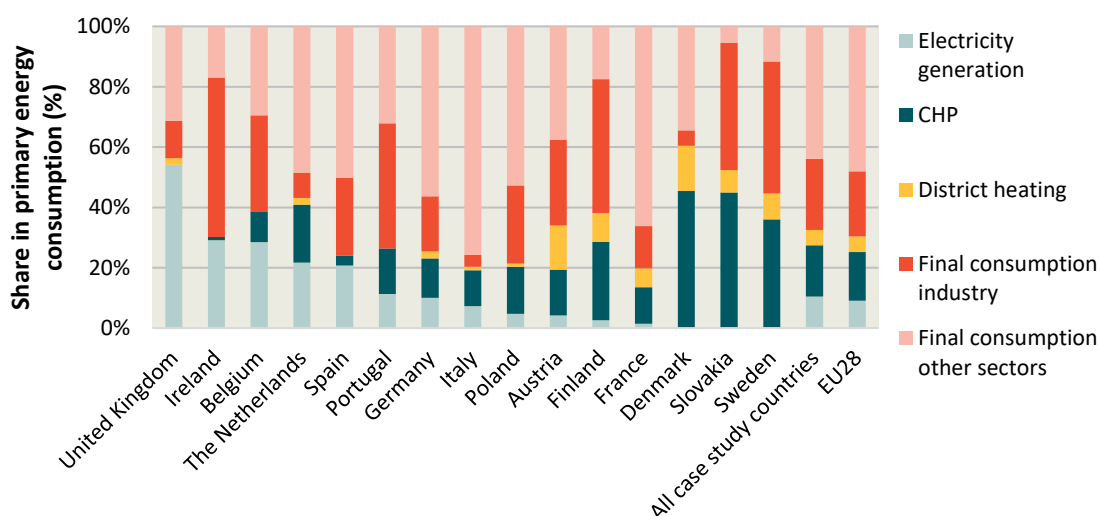
Table 0-2 Overview of the share of biomass in total renewable energy subsidies in 2015 and 2016

Country	Bioenergy subsidies (EUR million)		RES subsidies (EUR million)		Bioenergy as % of total	Bioenergy as % of total
	2015	2016	2015	2016	2015	2016
Finland	79	47	229	194	35%	24%
Austria	283	275	1 096	1 179	26%	23%
Belgium	279	309	1 395	1 378	20%	22%
United Kingdom	1 384	1 399	9 391	8 658	15%	16%
Sweden	60	53	381	368	16%	14%
Slovakia	52	67	474	464	11%	14%
Spain	781	948	9 261	8 179	8%	12%
Portugal	86	80	963	1 137	9%	7%
Germany	1 724	1 746	25 544	26 199	7%	7%
Italy	242	740	12 169	11 877	2%	6%
Poland	79	39	1 019	636	8%	6%
Ireland	4	9	97	160	4%	6%
Denmark	60	59	1 117	1 107	5%	5%
The Netherlands	29	57	863	1 159	3%	5%
France	256	319	5 544	6 497	5%	5%
Total	5 399	6 147	69 541	69 192	8%	9%

Uses of biomass

In the EU, the lion's share of solid biomass use for energy purposes is directly used by end-use sectors, referred to as 'final energy consumption', averaging around 70% in 2017. The picture is quite similar for the fifteen case study countries investigated in this study (Figure 0-2), with final consumption by industry and final consumption by other sectors averaging 67% in 2017. Of the remaining 30%, around 16% on average is used by CHP plants, 9% for electricity generation and 5% for district heating. However, the energy uses of solid biomass vary strongly from country to country. The most striking deviations from the general picture are the Scandinavian countries, where a significant share of the biomass is used in CHP plants and some west European countries, especially the UK, where a significant share of the solid biomass consumption is used for dedicated electricity generation.

Figure 0-2 Overview of the uses of solid biomass by consumption type in 2017



1 Introduction

This report is the main deliverable under a contract agreed with NRDC in May 2019. The work was commissioned by NRDC to improve the data available on subsidies to solid biomass for energy uses. This study provides the most up-to-date and comprehensive inventory of these subsidies available.

Objective of the assignment

The objective of this assignment was to gain more insight into the support to bioenergy offered in the EU, put this in the context of other renewable energy subsidies, and to analyze the ways in which bioenergy is used.

Scope

From an energy perspective, this assignment focused on the generation of electricity and heat (in combined heat and power plants) from solid biomass and on the financial support that is given to such activities. We also included any subsidies that incentivized biomass production, direct consumption or district heating using biomass. Given their direct and indirect relevance we include subsidies to production, investment, energy demand and energy savings. Direct subsidies supporting feedstock production were included but indirect supports were not.

Geographically, this study focused on the following 15 countries: the United Kingdom (UK), Germany (DE), The Netherlands (NL), Denmark (DK), France (FR), Italy (IT), Spain (ES), Poland (PL), Sweden (SE), Finland (FI), Portugal (PT), Belgium (BE), Austria (AT), Ireland (IE), Slovakia (SK).

Approach and methodology

The approach was based on a combination of data gathering from central sources and existing published work, complemented by primary data gathering by country experts for each of the 15 countries.

The work used a definition and approach to energy subsidies based on work on behalf of DG Energy at the European Commission, the latest iteration of which was the study on Energy Prices, Costs and Subsidies published in January 2019².

Among the key methodological issues is the definition of subsidies. There is not yet an internationally agreed definition of what constitutes an energy subsidy. This work draws upon definitions used by the OECD based on a subsidy being *"any measure that keeps prices for consumers below market levels, or for producers above market levels, or that reduces costs for consumers or producers"*. This includes the following types of measures:

- **Tax expenditures** (exemptions and reductions of energy taxes, exemptions and reductions in fuel excise taxes, exemptions and reductions of taxes and levies, exemptions and reductions of VAT, tax allowances, tax credits, accelerated depreciation, free allocations under EU-ETS), deduction of investments from income taxes.
- **Direct transfers** (grants, soft loans)
- **Indirect transfers** (feed-in tariffs, feed-in premiums, interruptible load schemes, power purchase agreements, price guarantees [cost support or price regulation], renewable energy

² Report can be accessed here: <https://publications.europa.eu/en/publication-detail/-/publication/d7c9d93b-1879-11e9-8d04-01aa75ed71a1/language-en>

quotas, tradeable certificates, capacity mechanisms). For tradable certificates it is noteworthy that the value of the certificates is generated in the market and not paid by a government institution, in contrast to FITs and FIPs which are paid out by government authorities.

These measures can constitute support to production, demand, investment or energy savings. Support to demand was only included in case it concerned specific support to biomass use. More general support for demand, e.g. compensations/rebates on overall energy or electricity costs for households were not included.

Hidden subsidies and carbon neutrality

It should be noted that general **energy tax exemptions** for biomass have been excluded from the scope of the work. The basis for including them as subsidies is complex, and we decided against their inclusion due to: (1) the difficulty to identify such 'hidden' exemptions, as they represent an absence of a tax, rather than a subsidy as such; (2) an unclear basis for the application of these exemptions, e.g. are they intended to only be applied to specific fuels, or is an exemption explicit; (3) the complexity of an assumption of a 'base case' for the tax, e.g. what rate would biomass be taxed at if included - i.e. should this default to fossil uses, and if so, which? ; (4) the resources required to make complete and robust estimates of the value of such exemptions, given the variety of potential variations in the exemption for different use cases and sectors; (5) the difficulty to produce similar values for other renewable energy sources, particularly relevant to the results in chapter 3; (6) the distorting effect of such exemptions on subsidy totals.

At the same time we also note that such exemptions do play a role in company investment decisions and their consideration of different energy sources.

We did identify a few such exemptions that are applied across the subject countries, if these were to be included then we would add the following subsidies to the analysis, see Table 1-1. There may be other such exemptions applicable in the subject countries but these are difficult to identify.

Table 1-1 Tax exemptions identified but excluded from the analysis

Country	Tax exemption name	Subsidy value (EUR m)		
		2015	2016	2017
Denmark	Energy tax exemption	806.1	863.3	989.1
Poland	Exemption on excise duty for electricity generation renewables (Stawki podatku akcyzowego)	43.2	31.7	24.9
Sweden	Energy tax act (Energiskatt)	289.8	328.0	295.5

We have also excluded **carbon tax exemptions** from the scope of subsidies covered. We recognize that this is a difficult issue, due to the assumption by most tax offices that bioenergy is carbon neutral and therefore is exempt from carbon-taxes levied on other fuels, such as those levied in Sweden and Denmark. This carbon neutrality assumption is questionable³ but for the purposes of this report we have accepted this basis and not considered carbon tax exemptions as a subsidy compared to other fuels.

³ An example of such discussion, in the US context, can be found here <https://www.scientificamerican.com/article/congress-says-biomass-is-carbon-neutral-but-scientists-disagree/>

RD&D subsidies

We have excluded subsidies to Research Development and Demonstration (RD&D), as these subsidies are judged not relevant to the scope of this work. As whilst R&D plays an important role in improving bioenergy technology, reducing costs and increasing its attractiveness in the long-term, there is no direct correlation between the R&D expenditures in a certain year and the level of biomass use in that same year.

Gap filling and estimation

It is often the case that subsidy values are not reported, or if they are reported, are only partially reported or are aggregated with other values not relevant for this work, e.g. renewable energy as a whole, or all bioenergy including biogas and biofuels which are outside the scope of this work. The study team has consulted with national agencies to access the best available data for the subsidy estimates, but in many cases estimation techniques have been applied to derive subsidy values. The main estimation techniques applied include:

- Linear scaling based on the solid biomass share. In those cases where only totals for bioenergy or total renewables were available, financial support was scaled down based on the share of solid biomass in that total.
- In case no data was available on the actual expenditures on operational support we have estimated this by assuming all electricity produced from solid biomass receives operational support. Values can then be estimated by multiplying the subsidy rates with the production volumes.
- For investment support instruments where there was no data on the costs of individual installations or projects we assumed that all projects had the same investment size.
- Where monetary flows were accounted in financial years deviating from calendar years, we split the financial years in two to estimate the financial flow for the calendar years, assuming the flows were equal for each month.
- The value for green certificates has been estimated by multiplying the total number of awarded certificates by the price per certificate, where possible accounting for price fluctuations within a year.
- In order to calculate forgone tax income, weighted average tax rate, based on the remaining energy mix (excluding solid biomass) was applied to the total solid biomass consumption volume.

Values have been converted to EUR using ECB average annual exchange rates.

We include a table of individual subsidies, sources and calculation approaches in Annex A of this report.

2 Support to solid biomass for energy use

This chapter presents an analysis of the data on subsidies for electricity from solid biomass.

2.1 Headline results

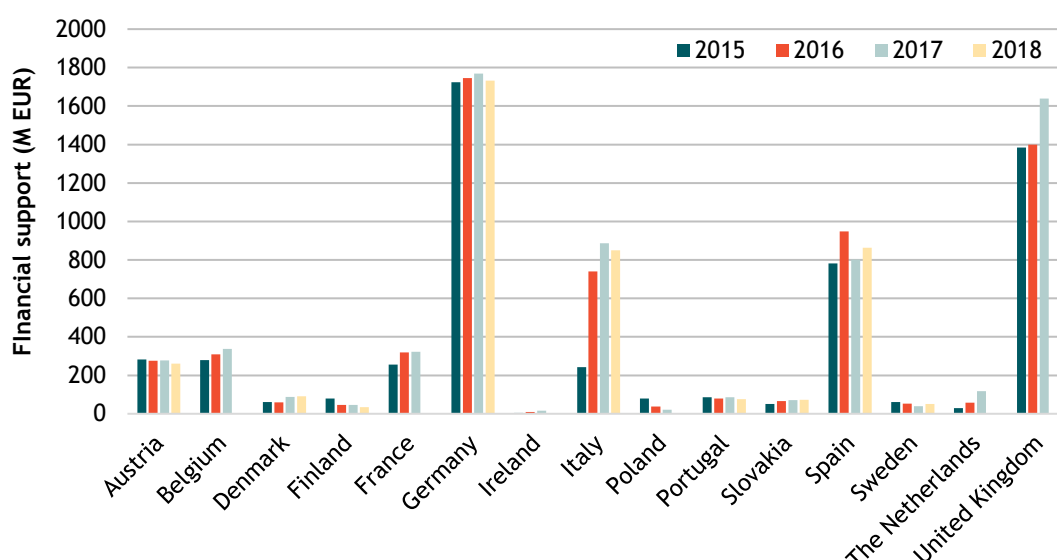
The compilation of subsidy data across the 15 selected countries of interest leads to a total of 46 policy instruments with a total value of just over €6.5 billion in 2017 (Table 2-1). Over the period 2015-2017 the total value of the subsidies provided to the use of solid biomass for energy purposes increased. The lion's share of this growth came from Italy (+645 M EUR), the UK (+255 M EUR) and the Netherlands (+88 M EUR). A large (-57 M EUR) decrease took place in Poland, relating to a reduction in the prices of green certificates. In 2018, the total amount of subsidies for those for which data is available shows a small decline from 2017 levels. However, when data from the other countries is available we expect the total to have grown again.

Table 2-1 Summary of bioenergy subsidies 2015-2018, EUR million

Country	Bioenergy subsidies (EUR million)				
	2015	2016	2017	2018	Change 2015-2018
Group 1 (2015-2018 data)					
Germany	1 724	1 746	1 768	1 733	0%
Spain	781	948	802	864	11%
Italy	242	740	887	849	251%
Austria	283	275	277	260	-8%
Portugal	86	80	86	77	-11%
Finland	79	47	46	35	-56%
Slovakia	52	67	72	72	40%
Denmark	60	59	87	91	44.5%
Sweden	60	53	39	50	-16%
Sub-total	3 368	4 015	4 064	4 031	19.7%
Group 2 (2015-2017 data)					Change 2015-2017
United Kingdom	1 384	1 399	1 639		18%
Belgium	279	309	338		21%
France	256	319	322		26%
The Netherlands	29	57	117		309%
Poland	79	39	22		-73%
Ireland	4	9	16		343%
Sub-total	2 031	2 132	2 454		20.9%
Total (Group 1 plus Group 2)	5 399	6 147	6 518		20.7%

* = For UK, France, Denmark and the Netherlands only partial data is available for 2018

Note: Some sub-totals and totals may differ from the sum of individual values due to rounding

Figure 2-1 Development of financial support for energy from solid biomass in the period 2015-2018

Note: the asterisks indicate when data is not available- this only applies to 2018 data.

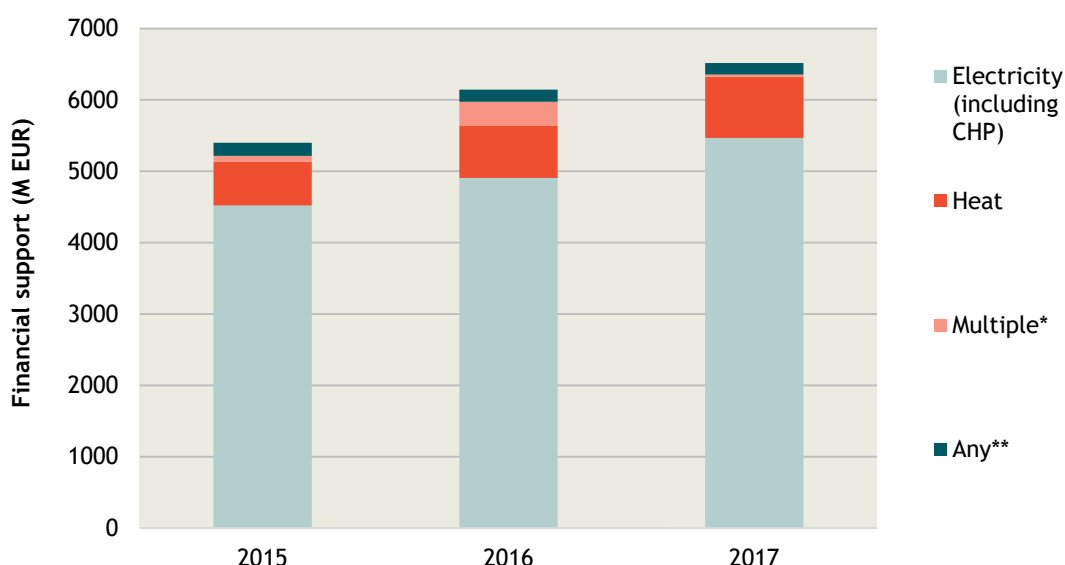
2.2 Detailed overall results

Breakdown by energy application

Although support instruments for electricity represent only half of the 46 policy instruments identified, financial support for electricity accounted for 79-83% of the total subsidy value in the period 2015-2017. Instruments supporting heat account for 11-13% of the total. Whilst the remaining instruments are a mix of those aiming to support multiple or any uses of biomass.

Specific instruments supporting the use of solid biomass in combined heat and power (CHP) plants are relatively scarce and represent a negligible share of the total subsidy value and therefore these are presented alongside electricity in the figure 2-2 below. However, it is important to note that instruments that support electricity production often do not discriminate between power generation only and CHP plants, meaning that CHP installations do receive support from such instruments. Similarly, instruments supporting multiple or any use of biomass can also support CHP plants. Some of the investment support instruments also support investments in CHP installations, but for most of those instruments the scope is broader than only CHP.

Figure 2-2 Breakdown of financial support for biomass by energy application



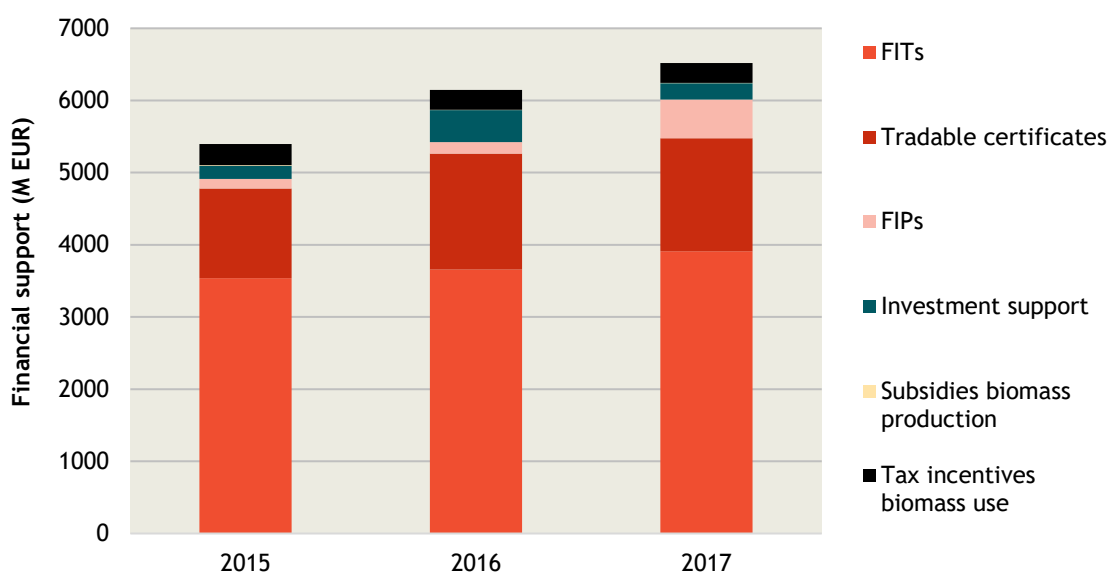
* 'Multiple' refers to instruments that support different types of biomass uses. In many cases these are investment support instruments, that for example support both investment in biomass boilers as well as (micro)CHP installations. ** 'Any' refers to policy instruments that support the use of biomass regardless of the use. Such instruments include tax reductions for biomass use or support to biomass production.

Breakdown by type of policy instrument

Around half of the instruments (24) provide operational support, meaning that financial support is given based on the level of production, but in terms of value these instruments account for 88-92% of the financial support given in the period 2015-2017. Direct subsidies from the government are still the most common form of operational support, with feed-in tariffs representing 60-66% and feed-in premiums 2-8% of the total subsidies given. The remaining 25-32% of operational support takes place via tradable certificates issued by the government, which are then sold on the market. As these tradable certificates provide a financial incentive for energy production with biomass these instruments can be seen as indirect subsidy instruments.

Tax instruments play a significant role in the support of biomass use in Europe, representing a value of €275-296 million annually. The largest part of this come from Austria, Belgium and Germany, which have reduced VAT tariffs for wood pellets. As noted in chapter 1 tax exemptions for bioenergy could also be regarded as subsidies, with examples identified in Denmark, Sweden and Poland, these are not included here, but would substantially increase the totals. Instruments that provide financial support to investments in biomass boilers or electricity generating installations are also significant, but more variable, accounting for €184-440 million annually over the period. Lastly, there are a few instruments that support the production of biomass itself by providing financial support to farmers or forestry industries, these are very small in total, providing between €5-8 million annually between 2015-2018.

Figure 2-3 Financial support for solid biomass by type of support instrument

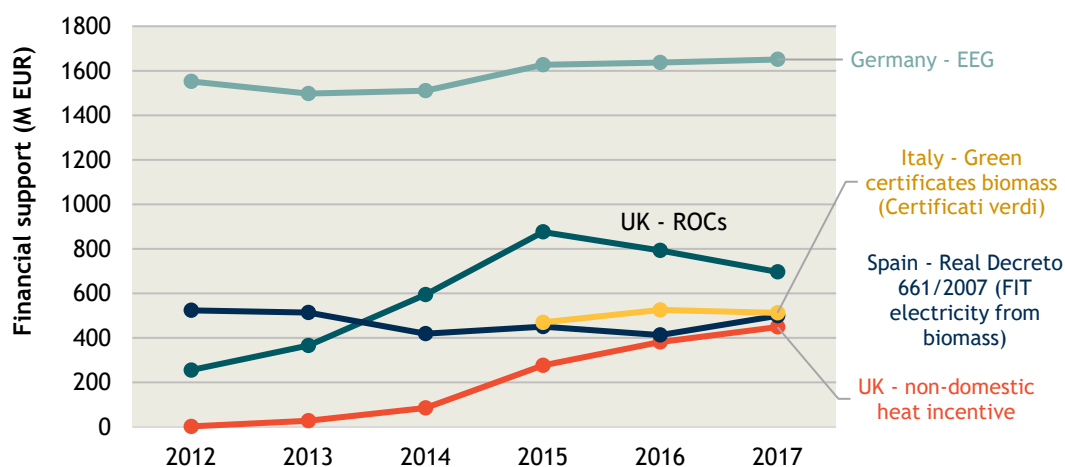


Note that all operational support instruments are indicated in pink/red colours. Additionally, two of the tax incentives for biomass use can be (partly) seen as operational support. Investment support instruments consist of a mix of investment subsidies, loans and tax incentives.

Long term developments in largest instruments

To be able to discern long-term trends in the level of financial support for biomass use for energy purposes, we analyzed the financial flows for the support instruments with an annual value >€500M from 2012 onwards. Overall, financial support for solid biomass use is on the rise, but in the last few years growth has levelled off. In the UK, revenues from the Renewables Obligation Certificates (ROCs) have decreased a little since 2015, although this is natural as the instrument is being replaced for new installations by a new subsidy policy, Contracts for Difference, which is estimated to already total around €360 million in 2018 and to be increasing. Whilst biomass is not a key component in most decarbonisation strategies, many countries do still foresee a significant role of solid biomass in their future energy mix, particular for use in (retrofitted) coal-fired power stations or in industry.

Figure 2-4 Development of financial support levels from 2012-2017 for the 5 largest support instruments



Note that for the green certificates scheme in Italy data is only available for the period 2015-2017. Since 2015 the format of the scheme has been reformed and the way of reporting has changed.

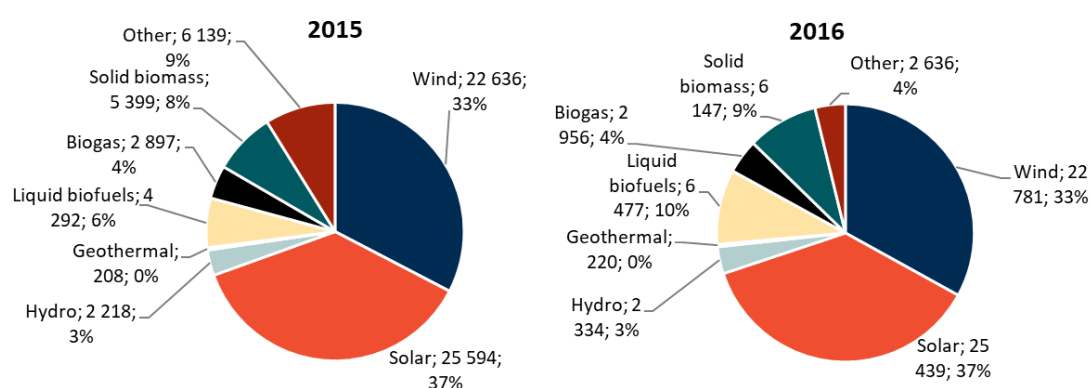
3 Bioenergy support in context

The previous chapter has demonstrated that bioenergy subsidies are substantial in many of the examined countries, but it is also important to understand how these fit within the overall structure of financial support to renewable energy. This chapter places the subsidies identified in the previous chapter in the context of all renewable energy subsidies in the respective country.

3.1 Bioenergy subsidies as share of all renewable energy subsidies

Data gathered in the Costs and Prices of EU energy study can be used to put bioenergy subsidies into the context of all subsidies to renewable energy.

Figure 3-1 Share of biomass energy in total renewable energy subsidies, for 15 selected countries, 2015 & 2016, million EUR and %



Source: Derived from figures presented in chapter 2 and totals provided in the Annexes to the report on the Costs and Prices of EU Energy (2018). Note: Figures are for 15 EU MS only and exclude R&D and Transport subsidies.

3.2 Detailed results

In eight of the case study countries subsidies for energy from solid biomass represent less than 10% of the total financial support given to renewables, in only three countries does it account for more than 20% of the total support given to renewables. There is generally a clear correlation between countries with high share of the renewables support going to biomass and the share of biomass in gross electricity generation. For the use of solid biomass in final energy consumption the relation with government subsidies seems to be less pronounced. It should be noted though, that in many countries the use of biomass for heating is less heavily taxed than the use of other energy carriers, and in many cases no energy taxes apply at all.

Table 3-1 Overview of the share of biomass in total renewable energy subsidies in 2015 and 2016

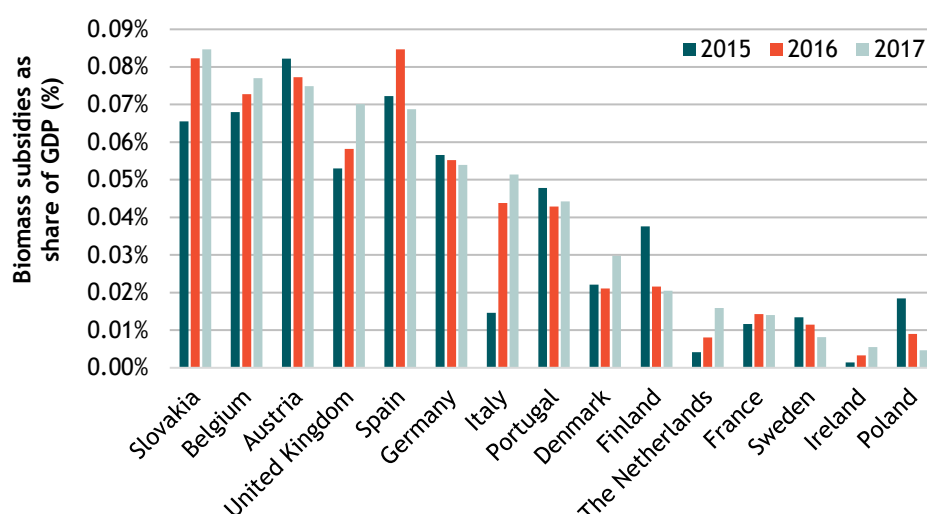
Country	Bioenergy subsidies (EUR million)		RES subsidies (EUR million)		Bioenergy as % of total	Bioenergy as % of total
	2015	2016	2015	2016	2015	2016
Finland	79	47	229	194	35%	24%
Austria	283	275	1 096	1 179	26%	23%
Belgium	279	309	1 395	1 378	20%	22%
United Kingdom	1 384	1 399	9 391	8 658	15%	16%
Sweden	60	53	381	368	16%	14%
Slovakia	52	67	474	464	11%	14%
Spain	781	948	9 261	8 179	8%	12%
Portugal	86	80	963	1 137	9%	7%
Germany	1 724	1 746	25 544	26 199	7%	7%
Italy	242	740	12 169	11 877	2%	6%
Poland	79	39	1 019	636	8%	6%
Ireland	4	9	97	160	4%	6%
Denmark	60	59	1 117	1 107	5%	5%
The Netherlands	29	57	863	1 159	3%	5%
France	256	319	5 544	6 497	5%	5%
Total	5 399	6 147	69 541	69 192	8%	9%

Comparison of relative subsidy levels

Apart from putting the total levels of financial support to biomass in the context of overall support levels for renewable energy, one can also relate the biomass support levels to other general country characteristics like the size of the economy, the population and the overall energy use.

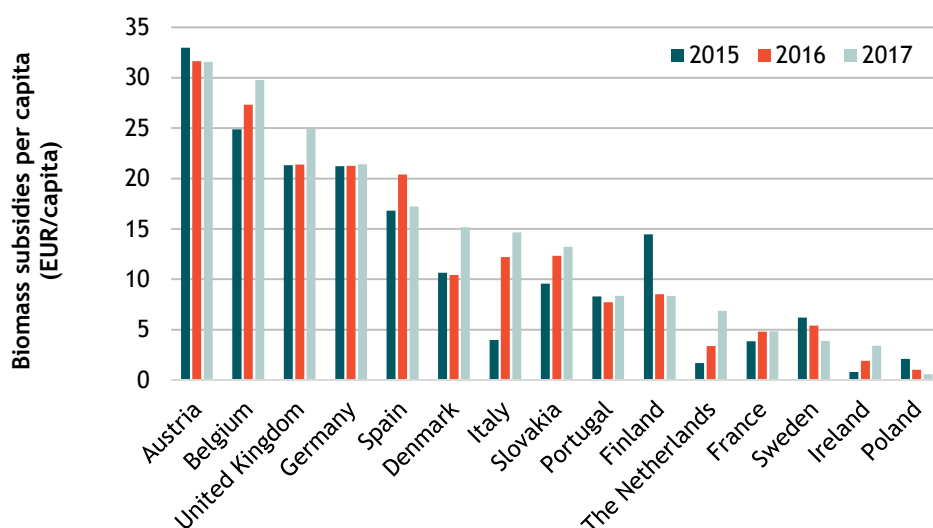
When looking at the subsidy levels in relation to GDP we see that the case study countries we selected spend between <0.01% and 0.08% of their GDP on support to solid biomass use (Figure 3-2). Slovakia spends the highest amount of money as biomass subsidies in relation to GDP, which is made up almost entirely by its OZE feed-in-tariff for biomass. After Slovakia, Belgium, Austria, the UK and Spain spends the next most on biomass support compared to the size of their economy, whilst Ireland and Poland spend the least. Finland and Austria spend the highest share of *renewable energy support* on solid biomass (see Table 3-1), but the share of the overall support levels in relation to the GDP of these countries is still rather low, due mainly to a high GDP level.

Figure 3-2 Expenditures on financial support to solid biomass in relation to GDP



One can also assess the expenditures on solid biomass in relation to the total population size (figure 3-3). In this comparison Austria, Belgium and the UK are the largest spenders, whereas France, Sweden, Ireland, and Poland spend the least per inhabitant. The disadvantage of this comparison is that the numbers can be misinterpreted very easily as the total subsidy amount is only partially spent by the government as actual subsidies. Some of the financial support is provided via market actors or mechanisms (e.g. in the case of green certificates), and some of the subsidies do not represent actual expenditure but rather foregone government income.

Figure 3-3 Expenditures on financial support to solid biomass in relation to population size



The most relevant comparison might be to compare the overall levels of financial support to the total level of energy consumption (figure 3-4) or more specifically the level of solid biomass consumption (figure 3-5). Relative to total energy use the highest subsidies are found in the UK, Austria and Spain, reflecting either high shares of biomass use, or high subsidies. The latter being the case in the UK as shown in Figure 3-5. In Ireland, Sweden and Poland, the expenditures relative to the total energy use are rather low. For Austria the reverse is true, as the costs relative to the overall energy use are relatively high, but in relation to total solid biomass use the support levels are quite low.

Figure 3-4 Expenditures on financial support to solid biomass in relation to overall energy use

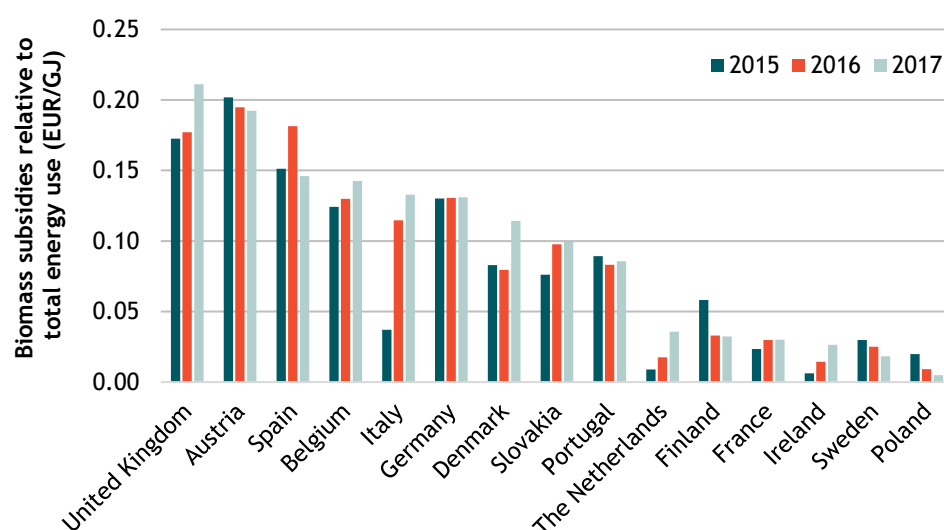
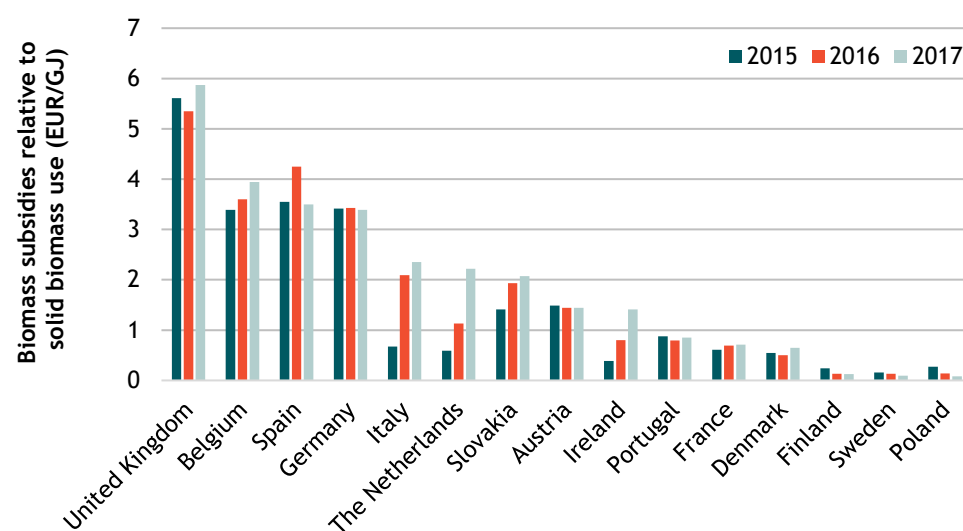


Figure 3-5 Expenditures on financial support to solid biomass in relation to gross primary energy consumption of solid biomass



4 Biomass use for bioenergy

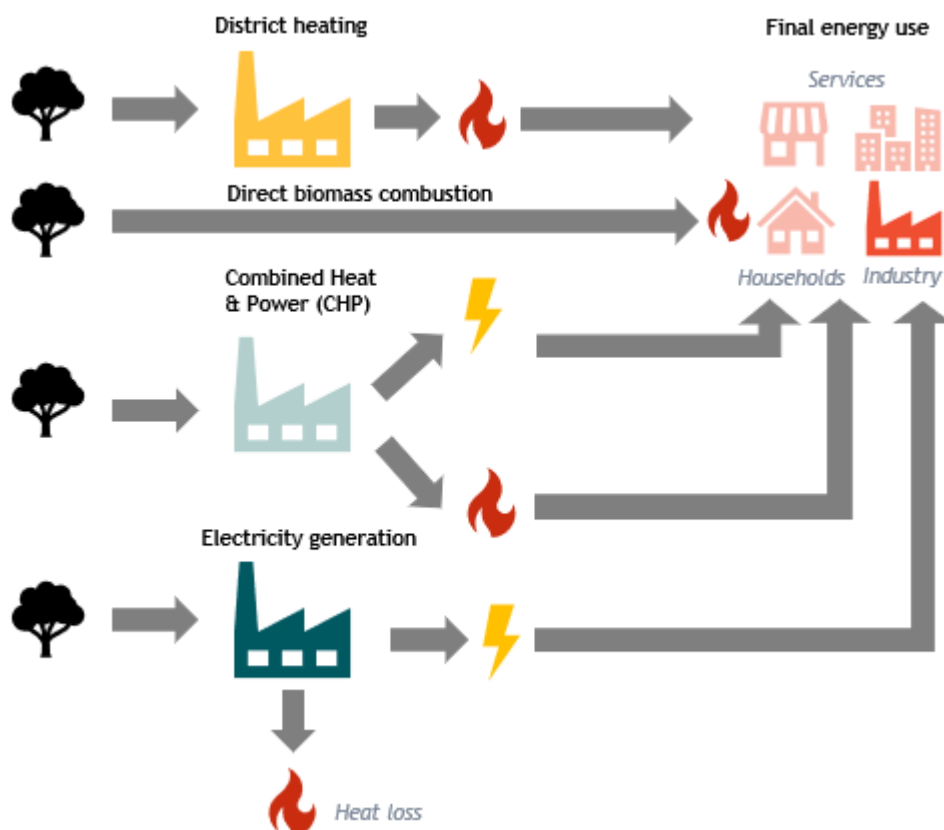
It is not only important to understand the level of support to bioenergy relevant for electricity and heat generation, but also to understand the impact this support is having on the type and size of biomass use. Understanding the type of use (co-firing with fossils, dedicated biomass, other), the efficiency of use (CHP, other) and the specific fuels being used are interesting to understand if policy is encouraging sustainable and efficient uses of biomass sources.

4.1 Headline results

4.1.1 Overview of the uses of solid biomass for energy purposes

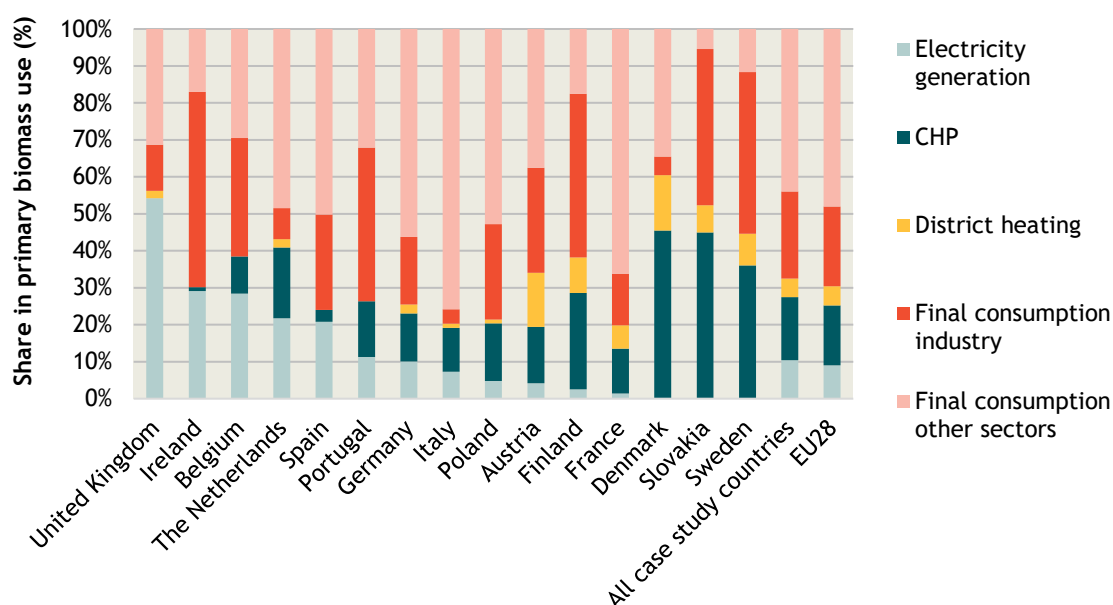
In our study of the energy uses of solid biomass, we looked at bioenergy that is used as a fuel in power plants, CHP plants or district heating plants as well as the final consumption by end-use sectors, such as industry, the residential sector and the services sector. In power plants biomass is used to generate electricity with an efficiency of 35-45% and the remainder of the energy is lost as heat. Combined heat and power (CHP) stations make more efficient use of the fuel as both the generated electricity as well as the heat are utilised to serve final energy demand. In district heating plants, all the fuel is converted into heat, which is then fed into the heat distribution grid to heat buildings. Lastly, solid biomass, e.g. firewood or wood pellets can be used directly in boilers to heat buildings or in industry for the generation of process heat. The different uses of solid biomass considered in this study are illustrated in figure 4-1 below. The colours used in this illustration for the different end-uses are used throughout the rest of this chapter.

Figure 4-1 Illustration of the different energy uses of solid biomass considered in this study



In the EU, the lion's share of solid biomass use for energy purposes is directly used by end-use sectors, referred to as 'final energy consumption', averaging around 70% in 2017. The picture is quite similar for the fifteen case study countries investigated in this study (figure 4-2), with final consumption by industry and final consumption by other sectors averaging 67% in 2017. Of the remaining 30%, around 16% on average is used by CHP plants, 9% for electricity generation and 5% for district heating. However, the energy uses of solid biomass vary strongly from country to country. The most striking deviations from the general picture are the Scandinavian countries, where a significant share of the biomass is used in CHP plants and some west European countries, especially the UK, where a significant share of the solid biomass consumption is used for dedicated electricity generation.

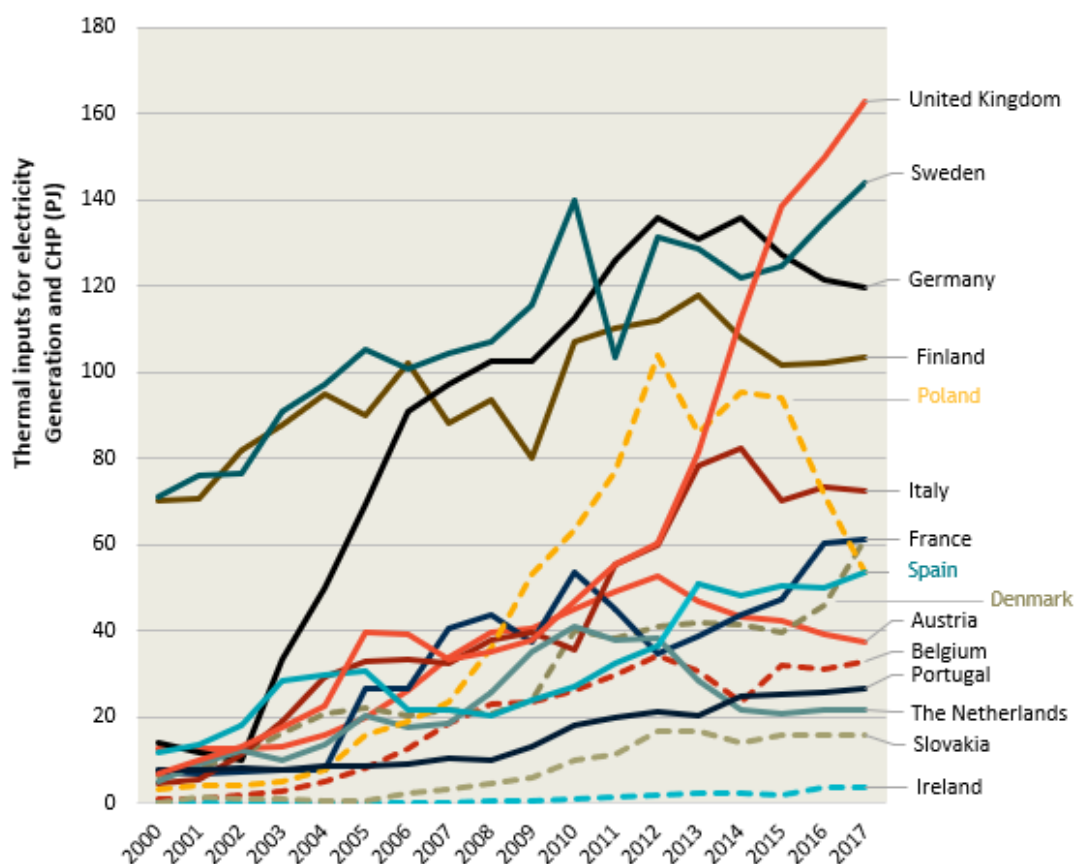
Figure 4-2- Overview of the uses of solid biomass by consumption type in 2017



4.1.2 Solid biomass use in electricity generation, district heating and combined heat and power plants

When we look at the use of solid biomass for electricity generation and as a fuel for CHP plants, we see a clear increasing trend since the year 2000 for all case study countries (see figure 4-3). The countries with the highest consumption of solid biomass in CHP plants and power plants are the UK and Sweden followed by Germany and Finland. The UK has shown a vast increase since 2010 and lately a relatively stronger growth is visible in France as well.

Figure 4-3 - Solid biomass inputs for electricity generation and combined heat and power for the period 2000-2017 (PJ).



Use of solid biomass in electricity generation

When looking at electricity generation from biomass, we see that the share of solid biomass in the electricity generation mix per country is highest in the Scandinavian countries (Figure 4-4, left). However, if we look at all the electricity that is generated from solid biomass in the European Union (Figure 4-4 right), we see that the largest part of this is produced in the UK (22%), followed by Finland (12%), Germany (11%) and Sweden (11%). This represents in the case of the UK and Germany their large overall size, and relatively high biomass use in the UK, and for Finland and Sweden a high share of biomass in their smaller, but still significant at EU level totals. Overall, the fifteen case study countries represent 93% of all the electricity generated from solid biomass in the EU28. The absolute levels of electricity generation from solid biomass from conventional power plants, as well as CHP plants, is shown in Figure 4-5.

Figure 4-4 Share of solid biomass in electricity generation in 2017 (left) and share of case study countries in total electricity generation from solid biomass in the EU28 (right).

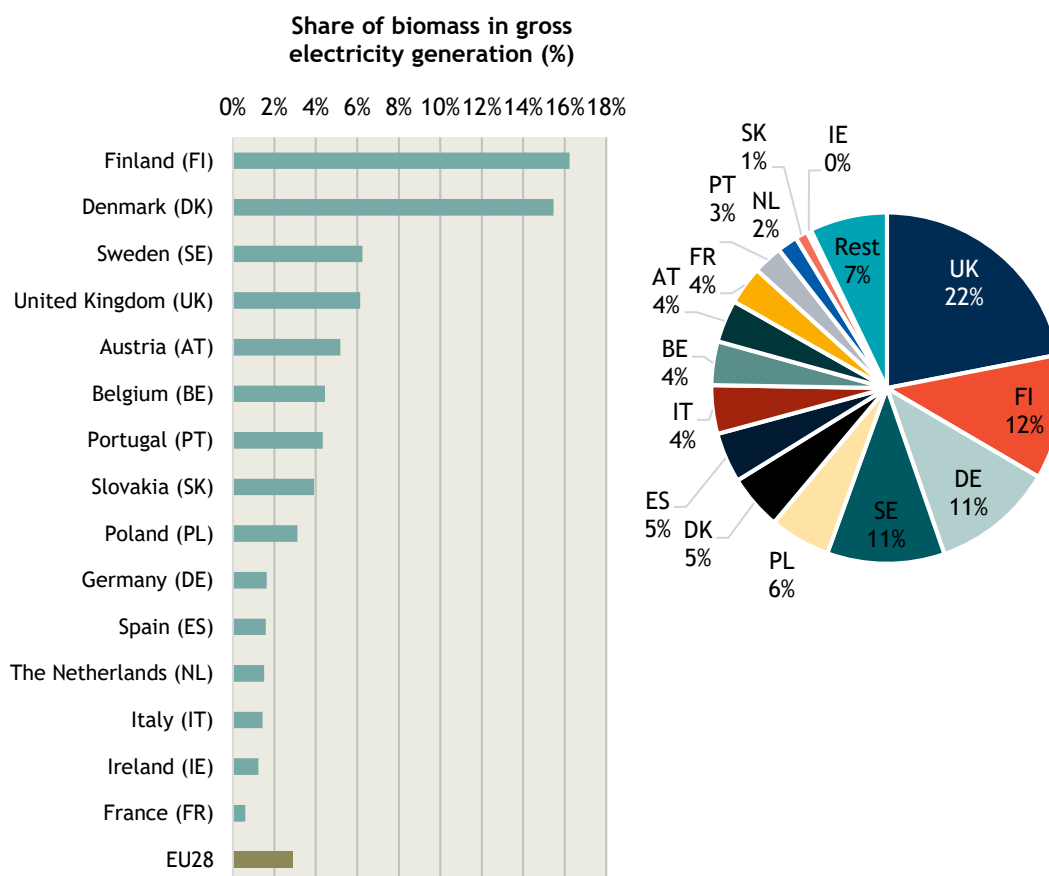
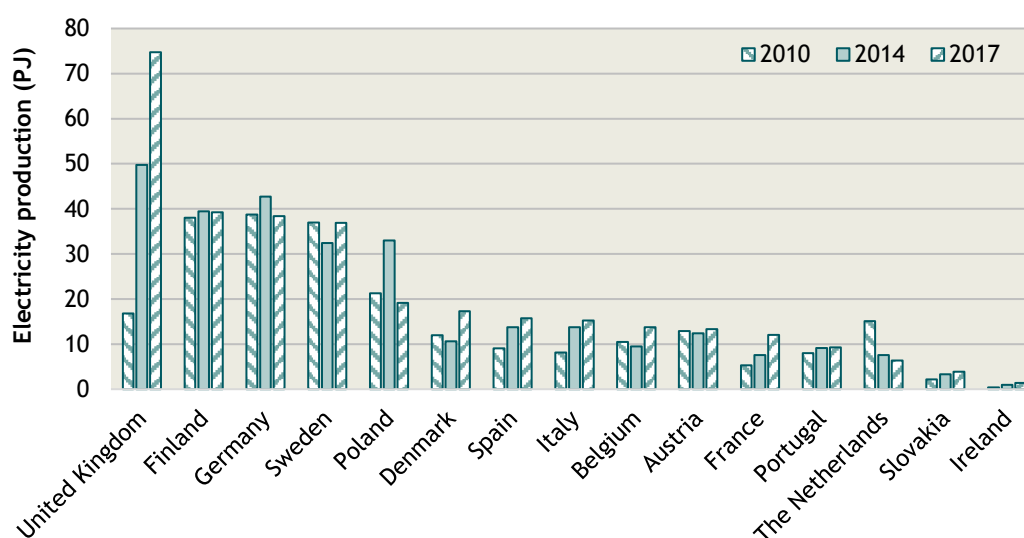
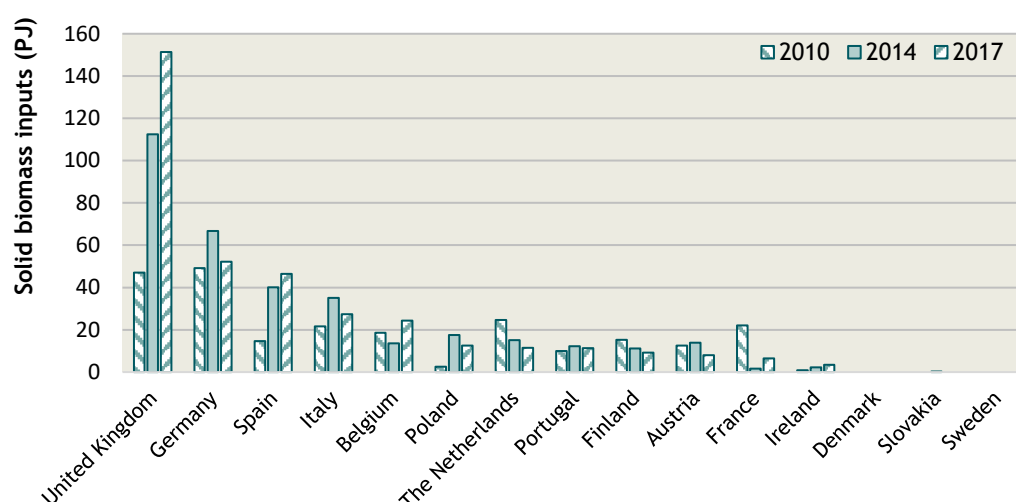


Figure 4-5 Absolute levels of electricity generation from solid biomass in 2010, 2014 and 2017 (PJ).



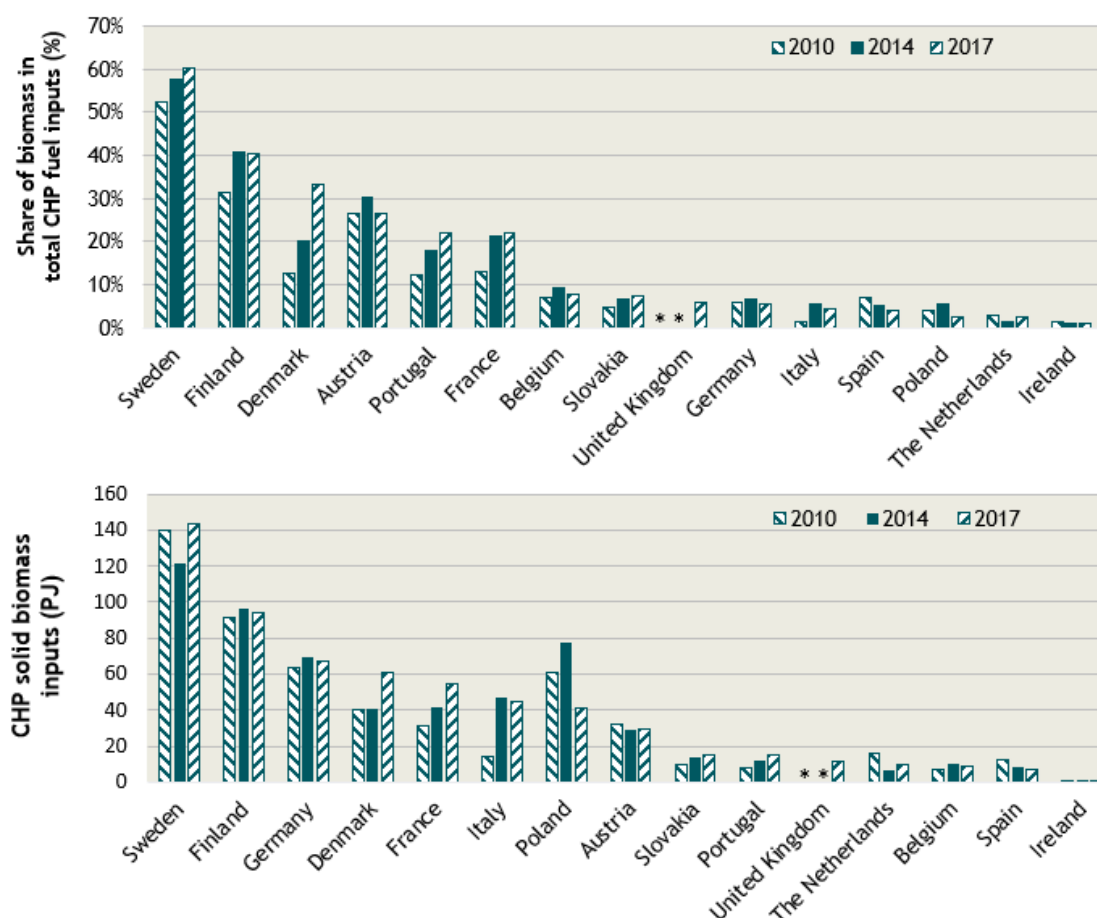
If we look at the use of biomass in power plants (so excluding CHP), we see that the use is highest in the United Kingdom, followed by Germany and Spain (Figure 4-6). When looking at all solid biomass inputs for power plants (excluding CHP), we see that the UK accounts for 40% of the total fuel consumption in the EU28, Germany for 14% and Spain for 12%.

Figure 4-6 How much solid biomass is burnt to generate electricity in power plants (excluding CHP)?

Use of solid biomass in combined heat and power plants

The use of solid biomass in CHP plants is common in Scandinavia and also in Austria (Figure 4-7). The frontrunner is Sweden, where solid biomass accounted for over 60% of the CHP fuel inputs in 2017, followed by Finland and Denmark. In Denmark, the use of solid biomass in CHP plants has grown substantially during the last decade, from around 13% in 2010 to 33% in 2017. Sweden and Finland are also leading in terms of the absolute solid biomass use for combined heat and power generation, and Germany follows as the third largest biomass consumer for CHP.

Figure 4-7 - How much of a nations CHP runs on biomass? - Share of solid biomass in fuel inputs for CHP installations as percentage of total fuel inputs (top) and in absolute fuel input levels (bottom).



* The biomass fuel inputs for the UK were 0 according to Eurostat. According to the biofuel map of biofuelwatch.org there are two operational CHP plants in the UK that currently use a total of 641 ktonnes of fuelwood and wood chips, which is equivalent to ± 11 PJ. No data was available for 2010 or 2014.

Use of solid biomass in district heating

District heating accounts for a relatively small part of the solid biomass consumption for energy in the EU. In Sweden the use of solid biomass for district heating has been common for a long time and accounts for two-thirds of the total fuel inputs for district heating (Figure 4-8). In Finland solid biomass use for district heating has grown strongly in the last decade with the share of biomass in total fuel inputs increasing from 34% in 2010 to 55% in 2017, thereby surpassing Sweden in terms of absolute biomass input levels. France has seen tremendous growth in the same period as well, with the biomass share in district heating increasing from 7% to 32%. On the other hand, in eight of the fifteen case study countries solid biomass hardly plays a role as fuel for district heating.

Figure 4-8 Use of solid biomass for district heating in absolute terms

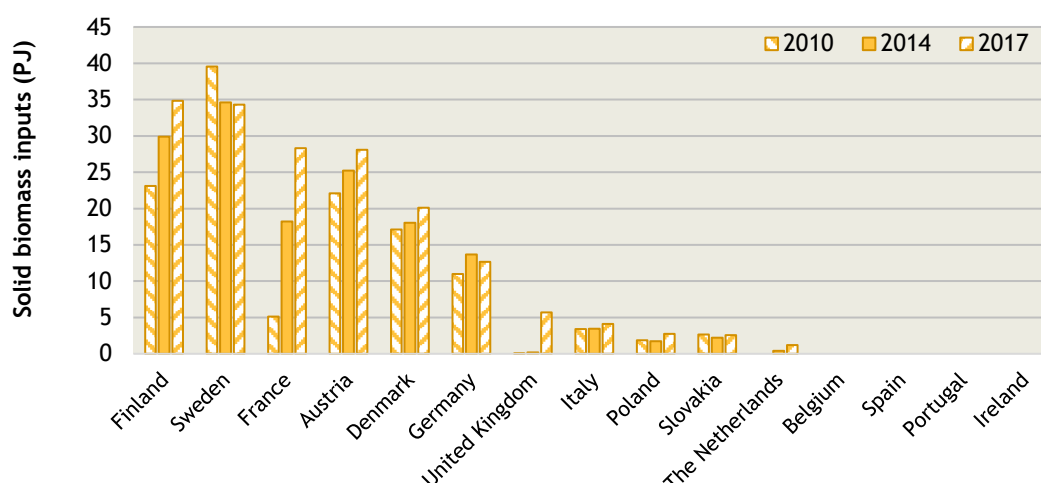
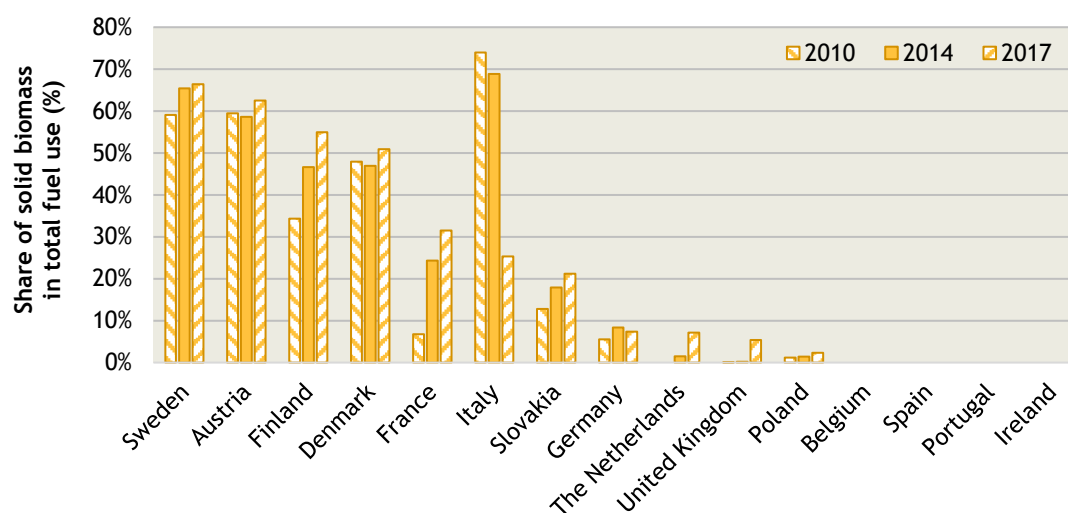


Figure 4-9 Use of solid biomass for district heating , as a share of all fuel inputs for district heating



4.1.3 Use of solid biomass in final energy consumption

Solid biomass is still commonly used as a fuel in final energy consumption, as shown in Figure 4-1 accounting for around 70% of all solid biomass use for energy in the EU. Most of the solid biomass use for final consumption is used in households for heating (around 62% at the EU28 level). Solid biomass has the highest share in final energy consumption in Finland, Sweden, Portugal and Austria (figure 4-10). However, due to their size, the absolute levels of final consumption of solid biomass are highest in Germany, France and Italy. In these countries, households are the dominant consumers and in Italy virtually all solid biomass is consumed in households (Figure 4-11). In Finland and Sweden on the other hand, industry is the dominant player in the final consumption of biomass, accounting for 72% and 79% of the total final biomass consumption in those countries, respectively.

Figure 4-10 Use of solid biomass in final energy demand (excluding transport), as a share of all energy carriers

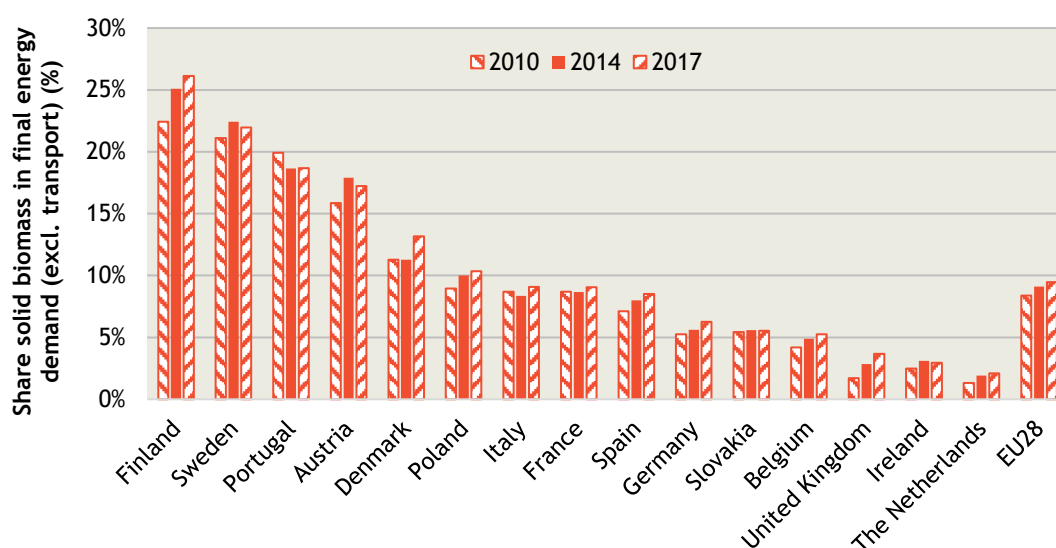
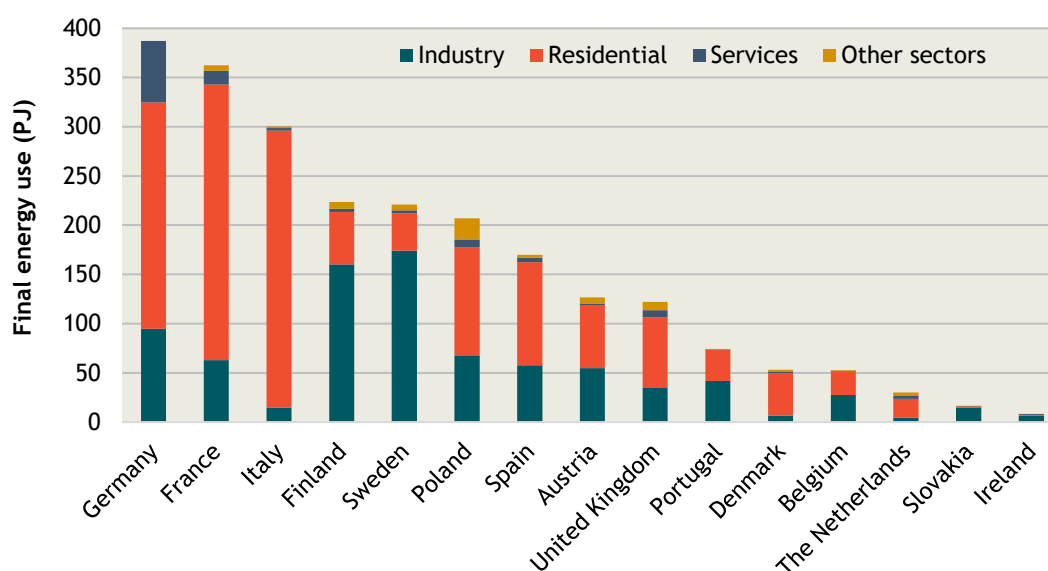


Figure 4-11 Use of solid biomass in final energy demand (excluding transport), in absolute terms for 2017, split by end-use sector



4.2 Detailed results

When considering the environmental impacts of solid biomass use, the uses of the biomass might be somewhat less relevant than the origin and types of the biomass use. The countries we investigated differ substantially in how they source their solid biomass and the types of biomass they use (Figure 4-12). In general, by far the largest part of the solid biomass use in the case study countries is produced domestically (covering 93% of the total consumption). However, there are some countries where imports account for a large share of the overall consumption, in particular in the UK, Denmark and Belgium (Figure 4-13).

Figure 4-12 The levels of solid biomass production, imports and exports in the case study countries for 2017.

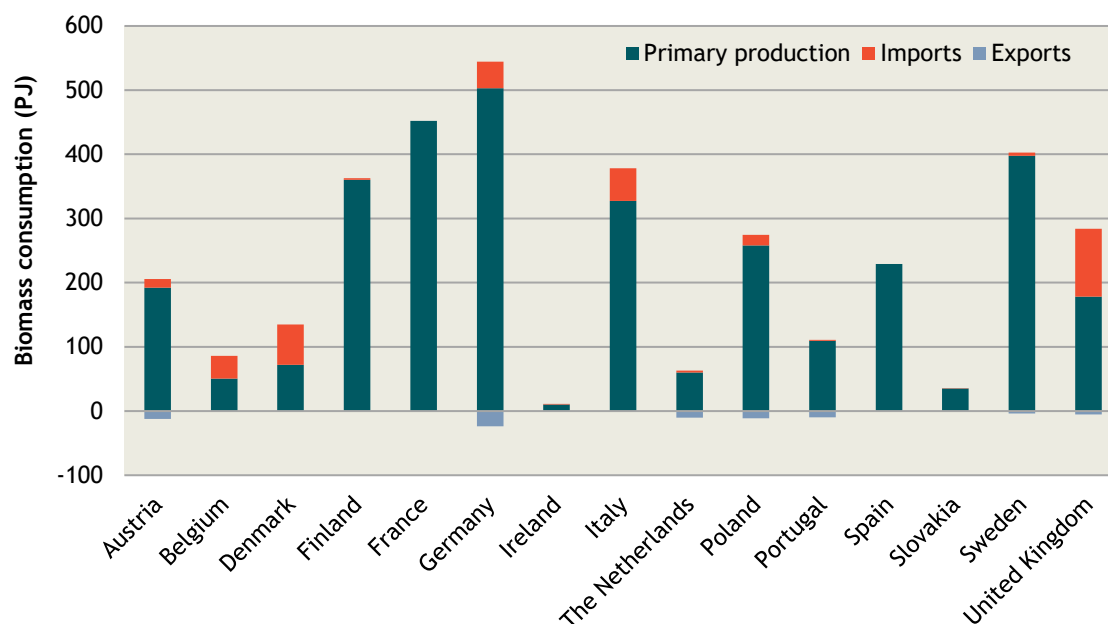
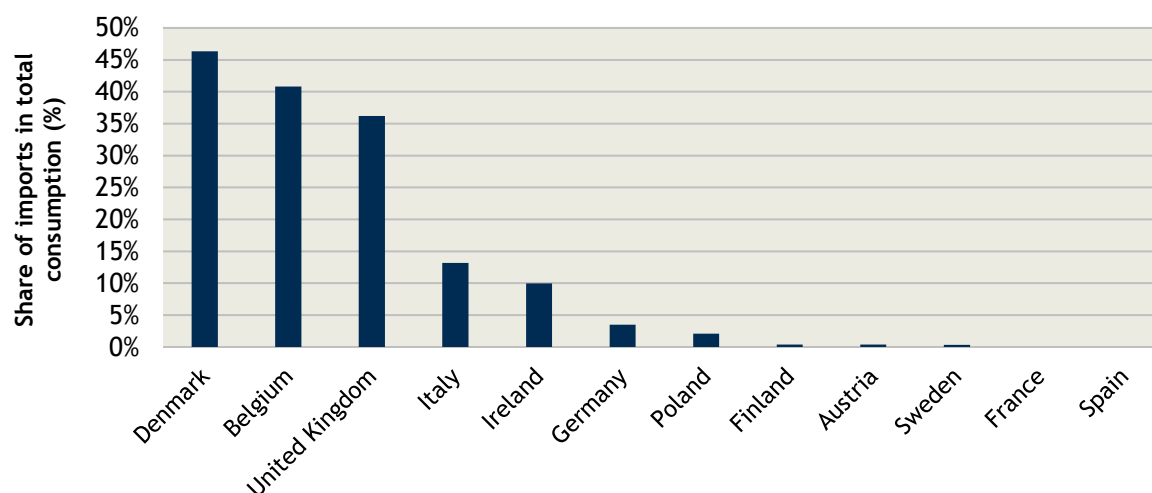


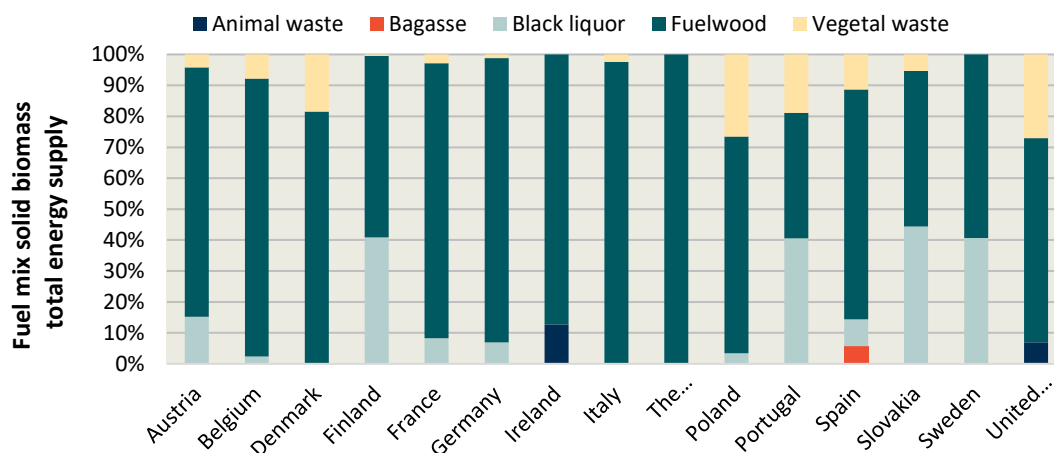
Figure 4-13 Share of net imports in overall consumption of solid biomass in 2017



Solid biomass types

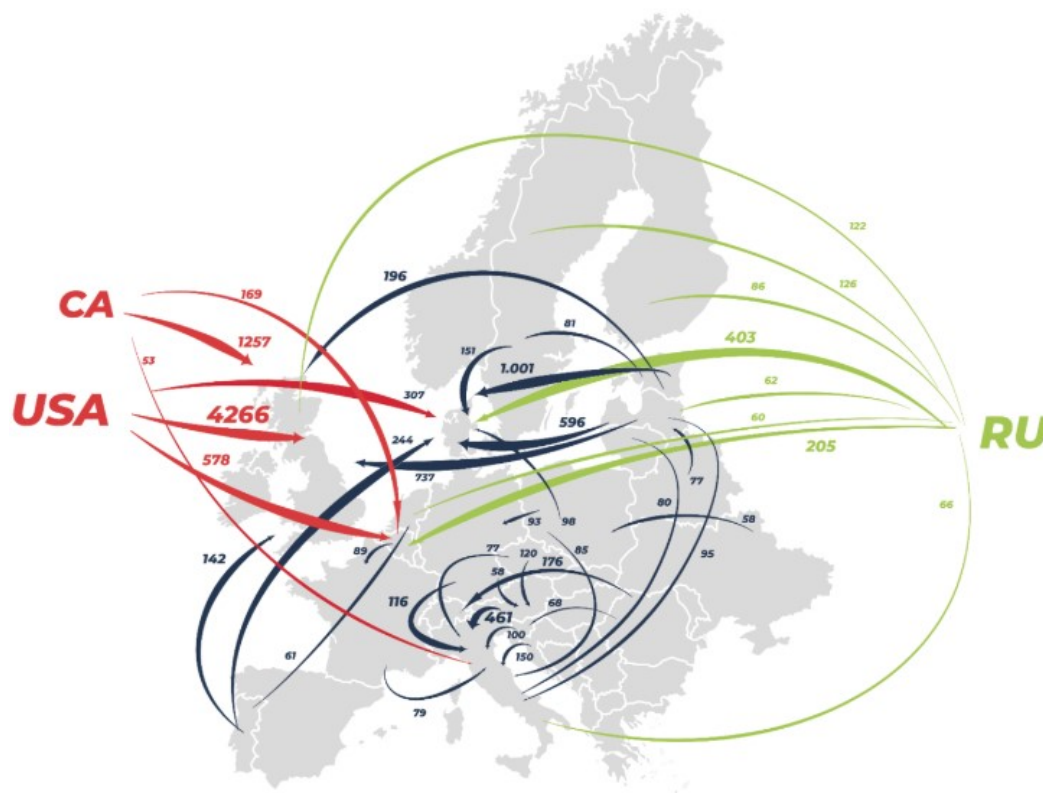
For the different types of solid biomass used, we see that firewood is the dominant type of solid biomass for energy use (Figure 4-14). In most countries vegetal waste (i.e. agricultural residues and organic municipal waste) is also used, and, especially in the UK, Poland, Portugal and Denmark, vegetal waste contributes significantly to the solid biomass supply. In Slovakia, Finland, Sweden and Portugal black liquor is also an important fuel in the solid biomass mix. Black liquor is mostly produced as a by-product in the pulp and paper industry.

Figure 4-14 The share of different biomass types in the energy mix of case study countries



Wood pellets, are an important fuel type in final energy consumption. In 2017, a total of 24 million tonnes of wood pellets were consumed.⁴ Although Europe is responsible for 77% of the global wood pellet consumption, it only accounts for 50% of the global production, meaning that a significant part of the wood pellets are imported, predominantly from the United States, Canada and Russia (Figure 4-15).

Figure 4-15 Map of wood pellet trade flows in the European Union



Source: European Pellet Council (2018).

⁴ European Pellet Council (2018) Statistical report 2018 - pellet report.
https://drive.google.com/file/d/14acLTbLFbhjRphKMyG0oR9ah_QCeU3U2/view

5 Country sheets

Austria (AT)

The main subsidy in Austria is the feed-in-tariff, expenditures on which have been relatively stable over the period. VAT reductions for investments in solid biomass installations are the next largest subsidy, of between €12.3 m to €13.9 m over the period 2015-17. The remaining subsidies are very low (less than €0.4m annual maximum) in comparison.

In February 2019, a planned renewal of the Feed-in Law to continue support for biomass installations in the coming three years did not receive the necessary two-third majority in the senate. Coalition parties in April 2019 then decided an alternative procedure, through which support will be mainly given on the regional/state (Länder) level. This procedure will continue support for the coming three years, after which a more fundamental revision of the Feed-in Law is planned.

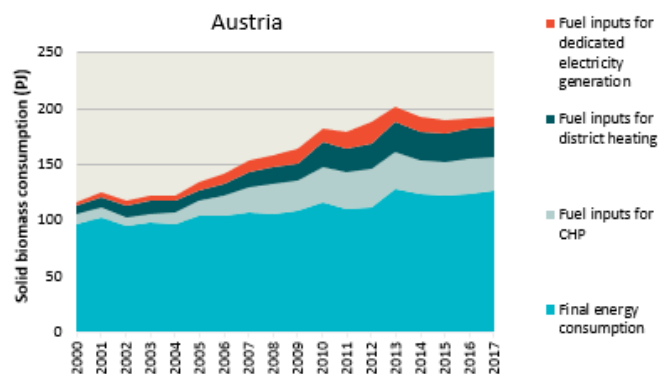
Austria

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy mix		
	2015	2016	2017	2015	2016	2017
Primary energy	190	191	192	18%	18%	18%
Final energy consumption	122	124	127	12%	11%	12%
Fuel inputs for electricity and heat generation						
	68	67	65	17%	16%	15%
Gross electricity generation	12.8	13.3	13.3	5%	5%	5%
Gross heat generation	35.6	37.0	38.0	43%	45%	46%

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	283	275	277	260
Share biomass subsidies in total subsidies for renewables (%)	26%	23%		



Subsidy instruments assessed:

- 1 Einspeisetarif Biomasse
- 2 Diversifizierung land- und forstwirtschaftlicher Betriebe durch Energie aus nachwachsenden Rohstoffen sowie Energiedienstleistungen - Bund
- 3 Diversifizierung land- und forstwirtschaftlicher Betriebe durch Energie aus nachwachsenden Rohstoffen sowie Energiedienstleistungen - Bundesländer
- 4 Reduced VAT tariff for wood pellets
- 5 -
- 6 -
- 7 -

Belgium (BE)

The main support instrument for biomass/biogas based production of electricity and heat is the certificate scheme. Between 2015-2018 this has not been subject to major changes; the actual changes mainly focused on implementation issues, such as the review of the technology specific banding factors and the suppliers quota. There are no major changes planned in 2019-2020.

Investments in installations for renewable electricity/heat are in general also eligible for corporate tax reduction; this instrument has also not been changed in 2015-2018. Finally, investments in renewable heat generation installations that are not eligible for subsidies via green certificates, can under certain conditions receive grants from regional authorities either via participation in open tenders, or directly. This instrument has also not been subject to a substantial change in 2015-2018, and major changes are not planned.

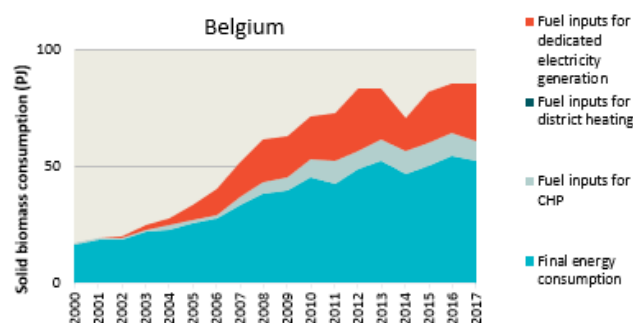
Belgium

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	82	86	86	6%	6%	6%
Final energy consumption	51	55	53	4%	4%	4%
Fuel inputs for electricity and heat generation						
	32	31	33	5%	4%	4%
Gross electricity generation	12.8	12.5	13.7	5%	4%	4%
Gross heat generation	0.2	0.3	0.3	1%	1%	1%

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	279	309	338	-
Share biomass subsidies in total subsidies for renewables (%)	20%	22%		



Subsidy instruments assessed:

- 1 Green electricity certificates (Flanders, Walloon and
- 2 Grants for investment in bio-heating installations (Flemish region)
- 3 Reduced VAT tariff for wood pellets

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Denmark (DK)

A major change in the Danish subsidies for bioenergy is the change in funding for the PSO-subsidy. Since 2016, the consumers' direct payment (the PSO tariff) has started being phased out, and will be funded by the Ministry of Finance (general taxes) from 2022.

Electricity produced by burning biomass has been able to apply for a price supplement of 15 øre/kWh (approx. 0.02 €/kWh). After April 1, 2019, there will be two support schemes for existing biomass plants. Non-depreciated plants, which will continue to receive support of 15 øre/kWh. Support for depreciated plants, waste facilities, etc., where support is provided for operating costs associated with burning biomass. Support for depreciated works etc. will not enter into force until the EU Commission has approved it.

In Denmark, there have in recent years been a conversion of power plants (both the central and decentralized) transitioning from firing with coal and gas to firing with wood chips and pellets. This is expected to continue in the coming years.

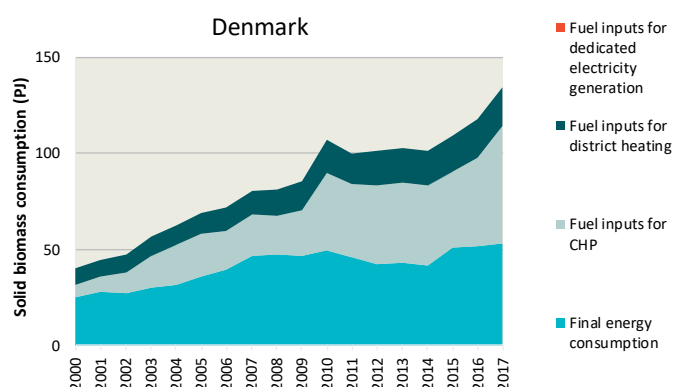
Denmark

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy mix		
	2015	2016	2017	2015	2016	2017
Primary energy consumption	110	118	135	20%	21%	23%
Final energy consumption	51	51	53	9%	9%	9%
Fuel inputs for electricity and heat generation						
	59	66	81	22%	23%	29%
Gross electricity generation	10.1	12.5	17.3	10%	11%	15%
Gross heat generation	43.9	47.5	56.6			

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	60	59	87	91
Share biomass subsidies in total subsidies for renewables (%)	5%	5%		



Subsidy instruments assessed:

- 1 Bekendtgørelse af lov om fremme af vedvarende energi, nr. 356 04/04/2019

Finland (FI)

In Finland biomass makes an important contribution to electricity and (especially) heat generation, supply a significant share of each. These use significant volumes of biomass, primarily from domestic sources.

The subsidy inventory found 5 instruments relevant for energy from biomass in Finland. The largest of these is a feed-in-premium for electricity from renewable sources (biomass), totalling around EUR 32 million in 2017, although this reduced to EUR 20 million in 2018. Limits on the subsidy were introduced in 2016 and the subsidy will be further reduced (to 60% of current levels) from 2019. Three of the subsidies support investment in solid biomass for electricity, heating and cooling or agricultural energy uses. One other subsidy supports the production of biomass from Finnish forests.

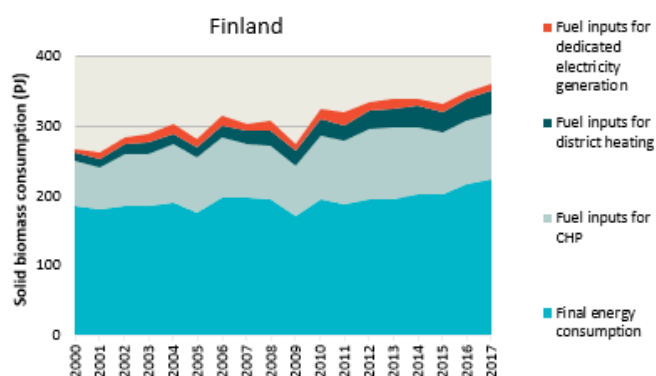
Finland

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy mix		
	2015	2016	2017	2015	2016	2017
Primary energy	332	350	362	34%	35%	35%
Final energy consumption	202	216	224	21%	22%	22%
Fuel inputs for electricity and heat generation						
	130	134	138	21%	21%	22%
Gross electricity generation	38.1	38.2	39.2	15%	15%	16%
Gross heat generation	67.5	73.7	71.4			

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	79	47	46	35
Share biomass subsidies in total subsidies for renewables (%)	35%	24%		



Subsidy instruments assessed:

- 1 Feed-in Premium for renewable electricity - Biomass (Syöttötäariffi, metsähake)
- 2 Energy aid (investment aid) for solid biomass electricity (Energiatuki, kiinteä biomassa)
- 3 Energy aid (investment aid) for solid biomass H&C (Energiatuki, kiinteä biomassa)
- 4 Energy aid (investment aid) for heating centers based on RE for farmers (Maatilojen lämpökeskusinvestoinnit)
- 5 Production support for biomass from forestry sector (Pienpuun korjuutuki (Kestävän metsätalouden
- 6 -
- 7 -

France (FR)

There were no major changes in 2015-2018 in the investment grants for renewable heat via the “Heat fund”. The overall “Heat Fund” budget will be further raised in 2019 and 2020 in order to reach the set renewable energy targets. Following the Law on Energy Transition for Green Growth of 17 August 2015, feed-in tariffs for biomass-fuelled renewable electricity generation are gradually being replaced with market-based subsidy schemes. Nevertheless, the current support framework (Law of 28 May 2016) still provides feed-in tariffs for small biogas installations (< 500 kW). For larger installations, feed-in premiums are introduced, i.e. production related subsidies granted on top of the electricity market price. These premium tariffs are either determined by the authorities (e.g. for biogas and biomass based renewable electricity production installations 0.5 - 12 MW since 1 January 2017) or via competitive technology-specific tenders.

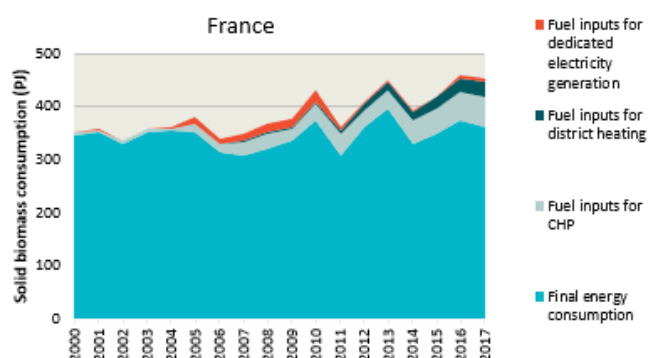
France

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	419	461	452	7%	8%	8%
Final energy consumption	350	374	362	6%	6%	6%
Fuel inputs for electricity and heat generation						
	69	87	90	1%	2%	2%
Gross electricity generation	9.1	12.4	12.0	0%	1%	1%
Gross heat generation	35.1	43.2	47.1	23%	29%	31%

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	256	319	322	-
Share biomass subsidies in total subsidies for renewables (%)	5%	5%		



Subsidy instruments assessed:

- 1 Contribution au service public de l'électricité pour l'électricité
- 2 Fonds chaleur

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Germany (DE)

In Germany, there is a trend of declining rates for the feed-in tariffs, but due to the presence of long-term contracts and a rise in the number of supported installations the total subsidy expenditures via the feed-in tariffs scheme are still increasing.

Feed-in tariffs for biomass installations per kWh were cut substantially over the last years, but due to the sharp rise in number of biomass installations this did not reduce overall costs for support:

Expenditures for feed-in tariffs were slightly increasing from € 1.724 bn euros in 2015 to € 1.733 bn in 2018. While growth in the installation of (wood-based) solid biomass installations in recent years has been flat.

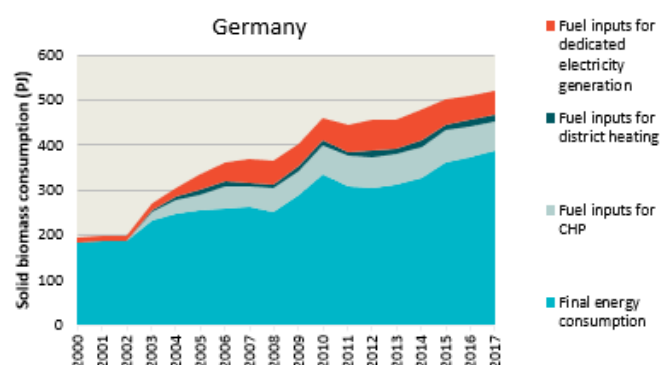
Germany

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	505	510	521	6%	6%	6%
Final energy consumption	363	375	387	4%	4%	5%
Fuel inputs for electricity and heat generation						
	141	134	132	3%	2%	3%
Gross electricity generation	39.7	38.9	38.4	2%	2%	2%
Gross heat generation	24.4	25.8	25.5	5%	6%	6%

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	1724	1746	1768	1733
Share biomass subsidies in total subsidies for renewables (%)	7%	7%		



Subsidy instruments assessed:

- 1 Erneuerbare Energien Gesetz 2017
- 2 KWK Umlage
- 3 Reduced VAT tariff for wood pellets

Ireland (IE)

The renewable energy feed in tariff (REFIT) used to be the dominant policy instrument for renewable energy support in Ireland but the instrument was closed in December 2015, although support for accredited generators will continue for a period of 15 years. REFIT is being replaced by the renewable energy support scheme. This is aimed at increasing the involvement of communities and will be characterized by a series of renewable energy auctions. The first auction is scheduled for 2019. Biomass schemes will be eligible (provided they comply with other criteria) but there will be a cap on individual technologies in each auction. The support scheme for renewable heat is designed to provide operational support (a tariff based on useable heat output) for biomass boilers and anaerobic digesters (plus investment support for heat pumps). Operational support opened for applications in 2019 and the period of support is 15 years.

Ireland

Energy contribution solid biomass

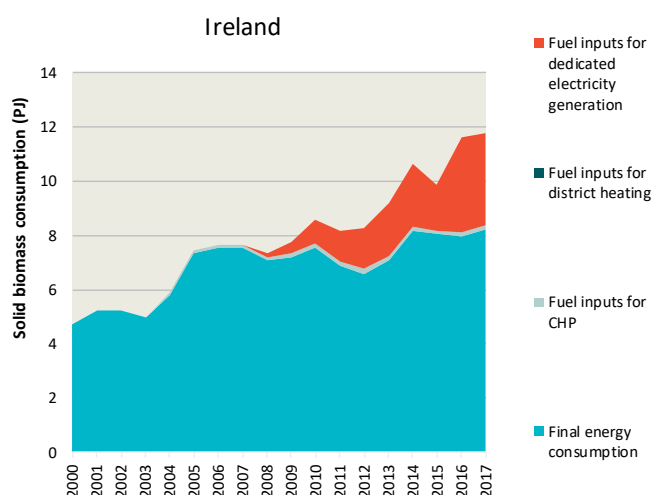
	Absolute consumption (PJ)			Relative share in domestic energy mix		
	2015	2016	2017	2015	2016	2017
Primary energy consumption	10	11	12	2%	3%	3%
Final energy consumption	8	8	8	2%	2%	2%
Fuel inputs for electricity and heat generation						
	2	4	4	1%	2%	2%
Gross electricity generation	0.7	1.4	1.4	1%	1%	1%
Gross heat generation	0.0	0.0	0.0	#DIV/0!	#DIV/0!	#DIV/0!

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	4	9	16	-
Share biomass subsidies in total subsidies for renewables (%)	4%	6%		

Subsidy instruments assessed:

- 1 BioEnergy (Willow) Scheme
- 2 Renewable Energy Feed-in Tariff (REFIT)



Italy (IT)

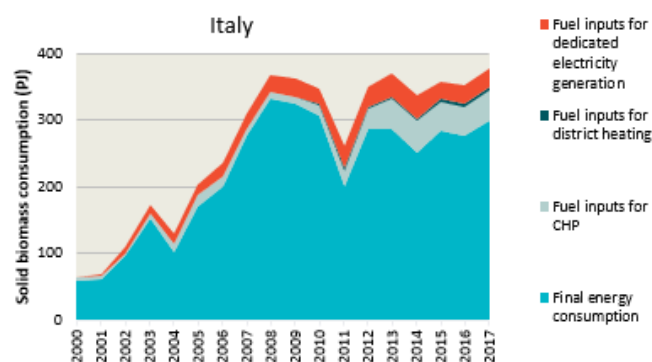
The Italian promotion and incentive system for electricity produced from renewable sources is characterized by a multiplicity of mechanisms that have followed over the years in a logic of progressive market orientation and reduction of the incentive level in line with the decrease of generation costs.

According to the draft of the Italy's National Energy and Climate Plan, foreseen by the governance of the energy union and climate action rules of the EU, the installation of new biomass heating systems will have to be guided in a way that favors high environmental quality and high efficiency plants. Potentially, this might also mean that limitations on some new installations might be considered in areas characterized by significant air quality problems. In order to stimulate the renewal of old plants with efficient technologies and reduced emissions, in the short term, more stringent performance requirements will be introduced for access to the incentives of biomass heat generators.

Italy

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	359	353	377	8%	8%	8%
Final energy consumption	285	276	300	6%	6%	6%
Fuel inputs for electricity and heat generation	74	77	76	3%	3%	3%
Gross electricity generation	14.2	14.8	15.2	1%	1%	1%
Gross heat generation	22.2	22.7	22.8	10%	10%	10%



Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	242	740	887	849
Share biomass subsidies in total subsidies for renewables (%)	2%	6%		

Subsidy instruments assessed:

- 1 Feed-in premiums (Incentivi del DM 6 luglio 2012)
- 2 Feed-in premiums (Incentivi del DM 23 giugno 2016)
- 3 Renewables decree - All-inclusive rate - Solid biomass (D.M. 18 december 2008 - "Tariffa onnicomprensiva")
- 4 Feed-in Tariff (old) Biomass and biogas (CIP6)
- 5 Green certificated biomass (Certificati verdi)
- 6 White certificates - Titoli di Efficienza Energetica (cosiddetti Certificati Bianchi) - Biomassa
- 7 Investment support for biomass boilers (Conto Termico 2.0)
- 8 Ecobonus

The Netherlands (NL)

In the Netherlands, the SDE+, a policy instrument that provides operational support via a sliding feed-in premium is the dominant source of subsidies for solid biomass use. It should be noted though, that anaerobic digestion plants still receive the bulk of the subsidies for electricity and heat production from biogenic sources under the SDE+ instrument. In 2017, solid biomass accounted for only 27% of the total subsidies for heat and electricity production from biogenic sources (up from 8% in 2015).

In 2016, subsidies have been awarded to four different coal-fired power plants for the co-firing of biomass. Most of these plants did not yet start their activities, partly because they have to find good sources of biomass that complies with the biomass sustainability criteria that have been implemented in the Netherlands in 2015 and also because of uncertainties surrounding government plans to close down coal-fired power plants before 2030. The first coal-fired power plant in Geertruidenberg initiated its co-firing activities in November 2018. Eventually, when co-firing in all four power plants is in full operation, annual subsidies for co-firing of biomass can increase up to a maximum of €3.6 billion.⁵ It is expected that the co-firing will be done with 85% wood pellets and 15% residual biomass streams. When the co-firing plants are fully operational it is expected that 3 million tonnes of wood pellets will be used. In relation to the total biomass subsidies in the Netherlands, these subsidies for co-firing will then represent around a quarter of the maximum expendable budget for solid biomass. There are no plans for further expansion of the support for co-firing of biomass in coal-fired power plants. There are also some policy instruments (subsidies and tax deductions) that support investments in biomass related technologies, like biomass boilers and biomass (micro)-CHP installations. However, these subsidies account for only a minor share of the total subsidies for biomass in the Netherlands.

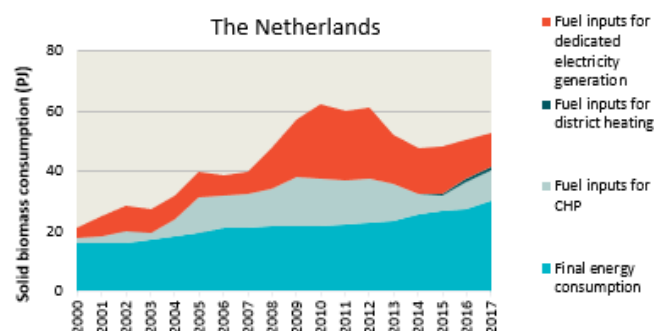
The Netherlands

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	48	51	53	3%	3%	3%
Final energy consumption	27	28	30	1%	1%	2%
Fuel inputs for electricity and heat generation						
	22	23	23	2%	2%	3%
Gross electricity generation	6.8	6.9	6.4	2%	2%	2%
Gross heat generation	1.6	2.1	4.2	1%	2%	3%

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	29	57	117	
Share biomass subsidies in total subsidies for renewables (%)	3%	5%		



Subsidy instruments assessed:

- 1 Stimulation sustainable energy (SDE+ regeling)
- 2 Investment subsidy sustainable energy (Investeringssubsidie duurzame energie -ISDE)
- 3 Energy investment deduction (Energie Investeringsaftrek -EIA)
- 4 -
- 5 -
- 6 -

⁵ It should be noted that the actual subsidies paid out are often much lower, as the subsidy levels are corrected for market prices.

Poland (PL)

In Poland the main support instrument for the energy use of solid biomass are the green certificates. Due to falling prices of the green certificates the level of electricity production from solid biomass has decreased in the last few years in Poland and so did the value of green certificate sales. In the residential sector, wood is still an important fuel for heating. In the longer term, biomass use is expected to grow in Poland. The National Energy and Climate Plan mentions that Poland has a large biomass potential and it proposes to utilize this potential especially for CHP and residential purposes. In relation to feedstock the focus is on the use of agricultural feedstocks and by-products from food production, but increased use of forest biomass is also anticipated.

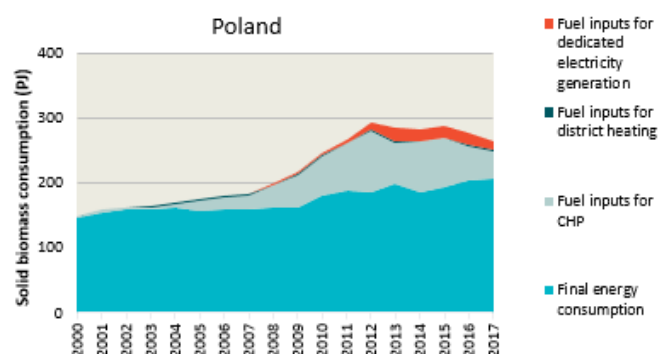
Poland

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	288	277	263	11%	10%	9%
Final energy consumption	193	203	207	8%	7%	7%
Fuel inputs for electricity and heat generation						
	96	74	56	6%	4%	3%
Gross electricity generation	32.5	24.9	19.1	5%	4%	3%
Gross heat generation	12.4	13.4	11.7	4%	5%	4%

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	79	39	22	
Share biomass subsidies in total subsidies for renewables (%)	12%	11%		



Subsidy instruments assessed:

- 1 Soft loans and grants for Thermal power stations and biomass heating plants (GIS)
- 2 Green certificates (Zielone Certyfikaty - PMOZE and PMOZE_A)

3 -
4 -
5 -
6 -

Portugal (PT)

The most important subsidy is the national strategic framework for the EU regional development fund. While the 2007-2013 national strategic framework programs are ending and the framework was not significant for biomass, with the gradual increase in programs started the subsidies under the 2014-2020 framework passed from 8 M EUR in 2015 to 129 M EUR in 2018. The existing feed-in tariff for electricity from biomass subsidy levels are stable for the considered period.

The Regime for new forestry biomass power plants was introduced in 2017, but no funds have been disbursed yet, with difficulties for the scheme implementation. The EU approved the Portuguese scheme as state aid on January 2019.⁶ The biomass sector foresees difficulties in implementing scheme due to forestry biomass scarcity arising from recent fires, so the Biomass for Energy Centre is conducting a study on the current needs of the biomass sector.⁷

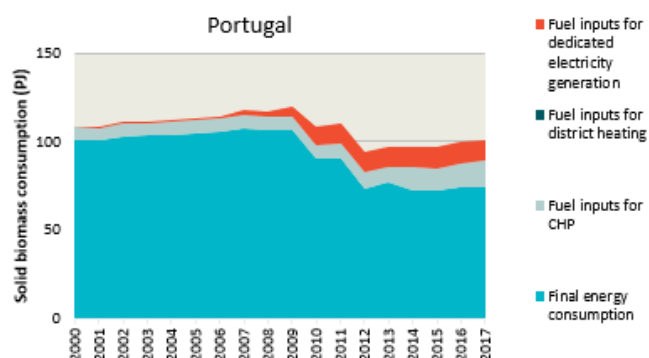
Portugal

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	98	101	101	16%	16%	16%
Final energy consumption	72	74	74	11%	12%	12%
Fuel inputs for electricity and heat generation						
	25	26	27	7%	7%	6%
Gross electricity generation	9.1	8.9	9.3	5%	4%	4%
Gross heat generation	0.0	0.0	0.0	0%	0%	0%

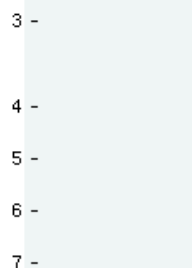
Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	86	80	86	77
Share biomass subsidies in total subsidies for renewables (%)	9%	7%		



Subsidy instruments assessed:

- 1 Produção em Regime Especial
- 2 Portugal 2020 - Quadro de Referência Estratégico Nacional (QREN) 2014-2020



⁶ EC (2019) SA.48881 Special regime of support for biomass-operated generators close to forests in Portugal

⁷ Jornal dos negócios (). Available at <https://www.jornaldenegocios.pt/empresas/energia/detalhe/governo-quer-incentivar-novas-centrais-de-biomassa-mas-materia-escasseia>

Slovakia (SK)

Biomass plays only a relatively small role in the energy system in Slovakia, and whilst this has increased significantly in the last 15 years, growth has slowed and it remains only 4% of final energy consumption.

Only two subsidy measures were detected in Slovakia, a feed-in tariff and an investment subsidy. The feed-in tariff provides between 70-92 EUR/MWh to energy generated from biomass, and provided €51m in 2015, increasing to €70m by 2018. The investment subsidy totaled only EUR 1-2 million per year over the 4 year period, and ended in 2018. A replacement program is scheduled to run from 2019-2023.

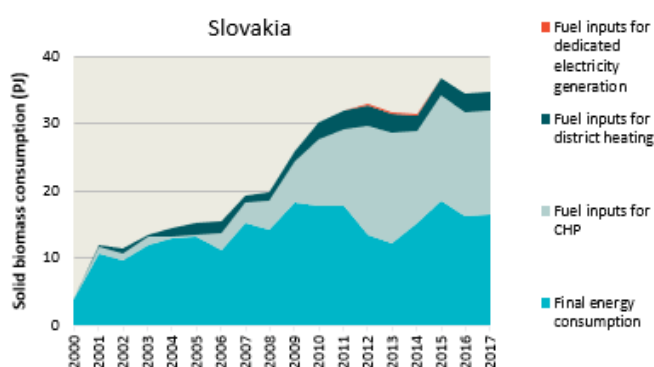
Slovakia

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	37	35	35	10%	9%	8%
Final energy consumption	19	16	17	5%	4%	4%
Fuel inputs for electricity and heat generation						
	18	18	18	6%	6%	6%
Gross electricity generation	4.0	4.1	3.9	4%	4%	4%
Gross heat generation	5.0	5.3	5.6	14%	14%	15%

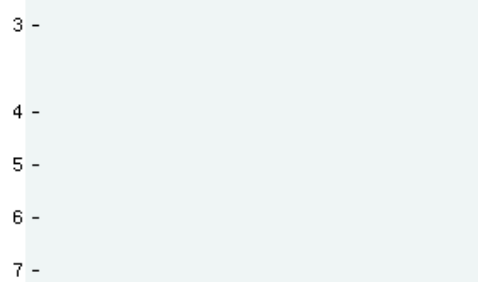
Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	52	67	72	72
Share biomass subsidies in total subsidies for renewables (%)	11%	14%		



Subsidy instruments assessed:

- 1 Podpora tarify za prevádzku systému obnoviteľných zdrojov
- 2 Zelená domácnosti I & II - Kotly na biomasu



Spain (ES)

Current national subsidies to solid biomass in Spain consist primarily of support to investments in installations -through grants and soft loans - provided by the National Energy Agency (IDAE) to households, business and public administration. The national Renewable Energy Plan (both 2005-2010 and 2011-2020) proposed measures related to the subsidies for projects and actions with direct influence in the biomass sector. There is also a scheme to support electricity from solid biomass, through a feed-in tariff. Both electricity generation from energy crops (e.g. fuelwood) as well as biowaste are eligible for support under this scheme. The support to investments schemes have been in place for about one decade and the support to production for two decades. For ongoing programs (i.e. Programa BIOMCASA, GIT BIOMCASA) there is no end date and are expected to continue until the budgets allocated to those are used by project applicants.

In the target scenario pursued in the new National Integral Energy and Climate Plan for 2012-2030 biomass energy is expected to more than double, which would lead, with no further policy changes to an increase in total financial support for biomass use.

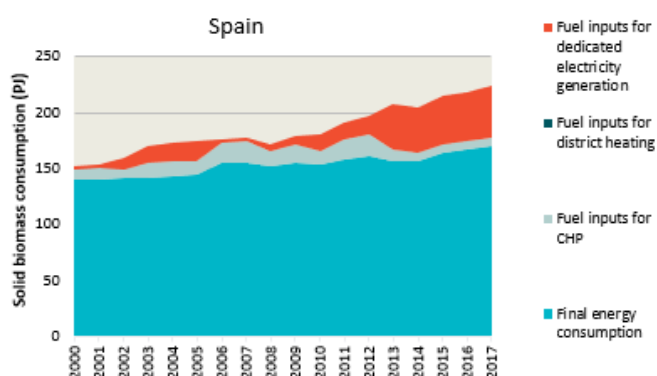
Spain

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy mix		
	2015	2016	2017	2015	2016	2017
Primary energy	220	223	229	7%	7%	7%
Final energy consumption	164	168	170	5%	5%	5%
Fuel inputs for electricity and heat generation						
	50	50	54	2%	2%	3%
Gross electricity generation	14.4	14.6	15.7	1%	1%	2%
Gross heat generation	0.0	0.0	0.0			

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	781	948	802	-
Share biomass subsidies in total subsidies for renewables (%)	8%	12%		



Subsidy instruments assessed:

- 1 Special regime for electricity generation - Biomass (energy crops) (Real Decreto 661/2007)
- 2 Special regime for electricity generation - Biomass (waste / residuos) (Real Decreto 661/2007)
- 3 Plan de Energías Renovables (PER) 2011-2020
- 4 -
- 5 -
- 6 -
- 7 -

Sweden (SE)

Bioenergy has been promoted in Sweden since the late 1970s, at the time mainly prompted by energy security concerns as a way to reduce Swedish import dependency on imported oil.⁸ A rapid expansion of CHP plants was facilitated by specific investment grants issues in the period of 1991-1995 and 1997-2003. Since then, the two main policy instruments indirectly promoting the use of bioenergy are the Energy and Carbon Tax introduced in 1991 and the Electricity Certificate System established in 2003.

The period of 2015-2018 saw some changes to the key supportive instruments, which may have an indirect impact on the use of bioenergy. The Electricity Certificate System has been extended until 2045⁹, while in 2015 the Parliament decided to increase the ambition level of production under the certificates scheme up to 2020 from 26.4TWh to 28.4TWh. This was in 2017 followed by a decision to further increase and extend the ambition of the system with an additional 18TWh by 2030. Finally, yearly quota levels up to 2030 were introduced in 2018. As for the Energy and Carbon Tax,¹⁰ the government proposed in 2019 to discontinue the energy tax reduction for CHP plants covered by the EU ETS, resulting in an increase to the energy tax from 30% to 100%¹¹. This proposed amendment to the tax is motivated by Sweden's ambition to phase out the use of fossil fuels, while the proposal has been met with stark criticism from the energy sector¹².

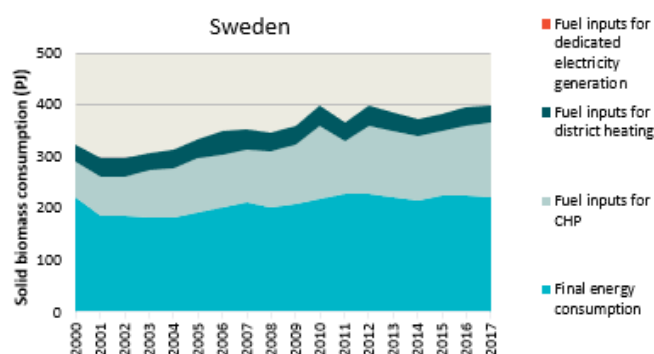
Sweden

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy		
	2015	2016	2017	2015	2016	2017
Primary energy	382	394	399	29%	29%	29%
Final energy consumption	225	225	221	17%	17%	16%
Fuel inputs for electricity and heat generation						
	157	169	178	13%	14%	14%
Gross electricity generation	32.3	35.1	36.9	6%	6%	6%
Gross heat generation	97.1	103.7	105.4	54%	58%	59%

Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	60	53	39	
Share biomass subsidies in total subsidies for renewables (%)	52%	58%		



Subsidy instruments assessed:

1 Electricity certificate system (Elcertifikatsystemet)

2 -

3 -

4 -

5 -

6 -

⁸ IEA Bioenergy (2018) Country Reports - Sweden 2018 update

⁹ Energimyndigheten (2017) <http://www.energimyndigheten.se/fornbart/elcertifikatsystemet/om-elcertifikatsystemet/>

¹⁰ In this study only the exemption from energy tax was counted as a subsidy in Sweden, as the exemption from carbon tax is based on the international convention to set GHG emission levels of all renewables including bioenergy at 0 kg/MWh.

¹¹ Finansdepartementet (2019) Höjd energiskatt och koldioxidskatt på bränslen vid viss användning samt höjd skatt på kemikalier i viss elektronik. Available online at <https://www.regeringen.se/490aef/contentassets/e9aac44d7310494da86ab1b49b5bc1ba/hojd-energiskatt-och-koldioxidskatt-pa-branslen-vid-viss-anvandning-samt-hojd-skatt-pa-kemikalier-i-viss-elektronik.pdf>

¹² Energiföretagen (2019) <https://www.regeringen.se/4938bc/contentassets/11b427b49d1245589534b125c956f538/energifoetagen-sverige.pdf>

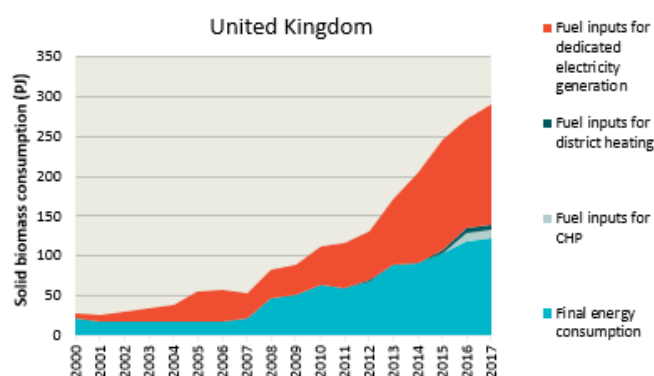
United Kingdom (UK)

The renewable obligation (RO) scheme used to be the dominant instrument for the support of large-scale renewable electricity generation in the UK, but this instrument closed to new generating capacity on 31st March 2017. Already accredited capacity will continue to receive support. The number of ROCs issued has fallen in recent years, so despite an increase in the value of each ROC, the overall subsidy level has decreased. The RO is being replaced by the contracts for difference (CfD). Renewable generators who are successful in an auction are paid a flat (indexed) rate for electricity over a 15 year period - based on the difference between the strike price established at auction and the reference price (a measure of average market price). New biomass conversion of existing plants, such as occurred at Drax Power, is no longer supported by the contracts for difference. Biomass technologies are only eligible if they are high efficiency CHP plants. In earlier rounds, Drax and Lynemouth Power received support for biomass conversion with a strike price of £113.65/MWh and £119.29/MWh respectively. Drax is currently active (645MW plant), whilst Lynemouth (420MW plant) entered service in June 2018. A further (300MW) plant in Teeside is due to enter operation in 2020 with a strike price of £141.8/MWh. There is a domestic renewable heat incentive (RHI) in the whole of the UK, but the non-domestic RHI is only in England, Scotland and Wales. The Northern Irish non-domestic RHI was suspended in 2016 due to lack of cost control and potential fraud.

United Kingdom

Energy contribution solid biomass

	Absolute consumption (PJ)			Relative share in domestic energy mix		
	2015	2016	2017	2015	2016	2017
Primary energy	247	261	279	5%	5%	6%
Final energy consumption	103	118	122	2%	2%	2%
Fuel inputs for electricity and heat generation						
	144	144	157	5%	6%	6%
Gross electricity generation	69.9	70.5	74.7	6%	6%	6%
Gross heat generation	3.3	3.3	3.6	5%	5%	5%



Subsidies

	2015	2016	2017	2018
Total subsidies solid biomass (EUR)	1384	1399	1639	-
Share biomass subsidies in total subsidies for renewables (%)	15%	16%		

Subsidy instruments assessed:

- 1 Domestic Renewable Heat Incentive (RHI) payments - biomass
- 2 Winter fuel payment - Biomass
- 3 Non-domestic renewable heat incentive
- 4 ROCs - Fuelled
- 5 Contracts for difference
- 6 -
- 7 -

Annex A: Detailed subsidy list and sources

Note: Where calculation approach is listed as N/A this means the data was available from the source.

Country	Instrument name	Instrument type	Use	2015	2016	2017	2018	Data source	Calculation approach
Austria	Einspeisetarif Biomasse	FIT	Electricity	270 400 000	262 700 000	263 200 000	260 400 000	Energie Control Austria: Annual amounts paid in FITs http://www.e-control.at/de/statistik/oeko-energie/oekostrommengen	N/A
Austria	Diversifizierung land- und forstwirtschaftlicher Betriebe durch Energie aus nachwachsenden Rohstoffen sowie Energiedienstleistungen - Bund	Investment support	Multiple		10 978			https://www.bmnt.gv.at/land/laendl_entwicklung/foerderinfo/sonderrichtlinien_auswahlkriterien/srl_le_2014-2020.html	N/A
Austria	Diversifizierung land- und forstwirtschaftlicher Betriebe durch Energie aus nachwachsenden Rohstoffen sowie Energiedienstleistungen - Bundesländer	Investment support	Multiple	329 701	7 318			https://www.bmnt.gv.at/land/laendl_entwicklung/foerderinfo/sonderrichtlinien_auswahlkriterien/srl_le_2014-2020.html	N/A
Austria	Reduced VAT tariff for wood pellets	Tax incentive	Any	12 321 239	12 585 442	13 925 664		National report	N/A
Belgium	Green electricity certificates (Flanders, Waloon and Brussels region)	Green certificates	Electricity	227 670 500	252 647 000	282 158 100		ICEDD : Bilans des Energies renouvelables Région wallonne; CWAPE : Rapports spécifiques électricité verte; Bruxelles Environnement : Rapports techniques; VREG : Certificatenmarktrapporten	N/A
Belgium	Grants for investment in bio-heating installations (Flemish region)	Investment subsidies	Heat	8 900 000	7 000 000	7 000 000		VITO : Inventaris Hernieuwbare energiebronnen in Vlaanderen	N/A
Belgium	Reduced VAT tariff for wood pellets	Tax incentive	Any	42 806 604	49 412 264	48 897 754		VITO : Inventaris Hernieuwbare energiebronnen in Vlaanderen	N/A

Country	Instrument name	Instrument type	Use	2015	2016	2017	2018	Data source	Calculation approach
Denmark	Bekendtgørelse af lov om fremme af vedvarende energi, nr. 356 04/04/2019	FIP	Electricity	60 297 775	59 403 270	87 112 483	90 699 601	https://ens.dk/sites/ens.dk/files/Analyser/ve-stoettefremskrivning_ifm._basisfremskrivning_2019_.pdf https://www.skm.dk/media/1827200/Afgifts-og-tilskudsanalysen-delanalyse-2.pdf https://ens.dk/sites/ens.dk/files/Analyser/notat_-_pso-fremskrivning_pba_bf2017_-_20170608.pdf	N/A
Finland	Feed-in Premium for renewable electricity - Biomass (Syöttötäriiffi, metsähake)	FIP	Multiple	33 188 187	32 280 151	31 767 132	19 587 396	Data from the monitoring database SATU operated by the Energy Authority.	N/A
Finland	Energy aid (investment aid) for solid biomass electricity (Energiatuki, kiinteä biomassa)	Investment subsidies	Electricity	27 880 000	-	-	-	Ministry of Economic Affairs and Employment, pekka.gronlund@tem.fi	N/A
Finland	Energy aid (investment aid) for solid biomass H&C (Energiatuki, kiinteä biomassa)	Investment subsidies	Heat	8 590 000	4 490 000	4 160 000	2 330 000	Ministry of Economic Affairs and Employment, pekka.gronlund@tem.fi	N/A
Finland	Energy aid (investment aid for heating centers based on RE for farmers (Maatilojen lämpökeskusinvestoinnit)	Investment support (subsidy/loan)	Heat	1 530 000	3 820 000	5 280 000	5 990 000	Ministry of Agriculture and Forestry, Kjell Brännäs, kjell.brannas@mmm.fi	N/A
Finland	Production support for biomass from forestry sector (Pienpuun korjuutuki (Kestävän metsätalouden määräraikainen rahoituslaki KEMERA))	Production support (wood chips)	Any	7 838 433	6 131 180	4 675 600	6 598 800	Ministry of Agriculture and Forestry, Marja Hilska-Aaltonen, marja.hilska-aaltonen@mmm.fi	N/A
France	Contribution au service public de l'électricité pour l'électricité (CSPE) - Contrats d'achat divers	FIT	Electricity	196 181 464	269 155 228	281 844 444		http://www.developpement-durable.gouv.fr/Presentation-generale,25.27.html	N/A
France	Fonds chaleur	Investment subsidies	Heat	60 000 000	50 000 000	40 000 000	40 000 000	http://www.developpement-durable.gouv.fr/Presentation-generale,25.27.html	N/A

Country	Instrument name	Instrument type	Use	2015	2016	2017	2018	Data source	Calculation approach
Germany	Enerneuerbare Energien Gesetz 2017	FIT	Electricity	1 627 330 232	1 636 717 379	1 650 663 744	1 732 643 485	EEG in Zahlen: Vergütungen, Differenzkosten und EEG-Umlage 2000 bis 2019 (Stand: 15. Oktober 2018)	Solid biomass share of total bioenergy subsidy
Germany	KWK Umlage	FIT	CHP	36 906 589	59 451 187	60 902 729		https://www.netztransparenz.de/KWKG/Jahresabrechnungen	Solid biomass share in CHP fuel inputs
Germany	Reduced VAT tariff for wood pellets	Tax incentive	Any	59 842 991	49 345 794	56 484 112		National report	N/A
Ireland	BioEnergy (Willow) Scheme (BioEnergy Establishment Scheme)	Biomass production support	Any	103000	5000			CSO - Environmental Subsidies.	N/A
Ireland	Renewable Energy Feed-in Tariff (REFIT)	FIT	CHP	3 563 012	9 025 393	16 236 482		Source: https://www.seai.ie/resources/seai-statistics/energy-data/	Total subsidy * Proportion of biomass in total of eligible energy technologies
Italy	Feed-in premiums (Incentivi del DM 6 luglio 2012)	FIP	Electricity	14 000 000	26 000 000	47 000 000	48 000 000	Gestore Servizi Energetici, Energy & strategy group	N/A
Italy	Feed-in premiums (Incentivi del DM 23 giugno 2016)	FIP	Electricity		-	3 000 000	12 000 000	Gestore Servizi Energetici, Energy & strategy group	N/A
Italy	Renewables decree -All-inclusive rate - Solid biomass (D.M. 18 december 2008 - "Tariffa onnicomprensiva")	FIT	Electricity	95 000 000	90 000 000	89 000 000	100 000 000	Gestore Servizi Energetici, Energy & strategy group	N/A
Italy	Feed-in Tariff (old) Biomass and biogas (CIP6)	FIT	Electricity	109 075 472	96 096 369	88 586 626	43 754 879	Gestore Servizi Energetici, Energy & strategy group, Eurostat [nrg_bal_c]	Total subsidy * proportion of biomass in energy balance with biogas
Italy	Green certificates biomass (Certificati verdi)	Green certificates	Electricity		470 000 000	526 000 000	513 000 000	Gestore Servizi Energetici, Energy & strategy group, Eurostat [nrg_bal_c]	N/A
Italy	White certificates -Titoli di Efficienza Energetica (cosiddetti Certificati Bianchi) - Biomassa	Investment subsidies	Heat	13 272 166	26 532 634	43 174 445	34 274 373	Gestore Servizi Energetici, Energy & strategy group; ARERA	Total certificates * Annual cost per unit

Country	Instrument name	Instrument type	Use	2015	2016	2017	2018	Data source	Calculation approach
Italy	Investment support for biomass boilers (Conto Termico 2.0)	Investment subsidies	Heat	10 833 000	21 210 000	51 050 000	98 400 000	Gestore Servizi Energetici, Energy & strategy group	N/A
Italy	Ecobonus	Tax deduction for investments	Heat		10 500 000	39 500 000		ENEA - National Agency for New Technologies, Energy and Sustainable Economic Development	N/A
Poland	Soft loans for Thermal power stations and biomass heating plants (GIS)	Investment subsidies and loans	CHP	233 804	190 157	194 952		Sprawozdanie z działalności Narodowego Funduszu Ochrony Środowiska i Gospodarki Wodnej w 2008-2016 roku (Report on the activities of the National Fund for Environmental Protection and Water Management in 2008-2016)	Total loan * (difference between market interest rate and loan interest rate)
Poland	Green certificates (Zielone Certyfikaty - PMOZE and PMOZE_A)	Green certificates	Electricity	79 037 222	38 333 542	21 542 953		Polish Power Exchange, Property Rights Market, Archive of trading sessions	Total certificate value * biomass share in RES generation
Poland	Investment support dispersed Renewable Energy Sources (BOCIAN)	Investment loans	Multiple	105 347	87 223	89 423		Sprawozdanie z działalności Narodowego Funduszu Ochrony Środowiska i Gospodarki Wodnej w 2008-2016 roku (Report on the activities of the National Fund for Environmental Protection and Water Management in 2008-2016)	Support * (difference between market interest rate and loan interest rate)
Poland	Programme for projects in the field of renewable energy sources and high-efficient CHP plants.	Investment loans	Multiple	340 672	44 011			Sprawozdanie z działalności Narodowego Funduszu Ochrony Środowiska i Gospodarki Wodnej w 2008-2016 roku (Report on the activities of the National Fund for Environmental Protection and Water Management in 2008-2016)	N/A
Portugal	Produção em Regime Especial	FIT	Electricity	85 936 910	79 807 057	85 936 129	76 515 143	http://www.erse.pt/pt/desempenhoambiental/prodregesp/Paginas/default.aspx http://www.dgeg.gov.pt/default.aspx?cn=738680528054AAAAAAAAAAAA http://www.dgeg.gov.pt/default.aspx?cn=636364478051AAAAAAAAAAAA	N/A
Portugal	Portugal 2020 - Quadro de Referência Estratégico Nacional (QREN) 2014-2020	Investment loan	Heat	8 514	91 090	152 101	128 553	https://www.portugal2020.pt/ https://poseur.portugal2020.pt/pt/candidaturas/candidaturas-aprovadas/	N/A
Slovakia	Podpora tarify za prevádzku systému obnoviteľných zdrojov (OZE)	FIT	Electricity	51 708 047	65 659 532	70 546 804	70 116 869	http://www.urso.gov.sk/?q=Informacny-servis/Zverejnenie-udajov-podla-%C2%A79-ods-5-zakona-309-2009	N/A

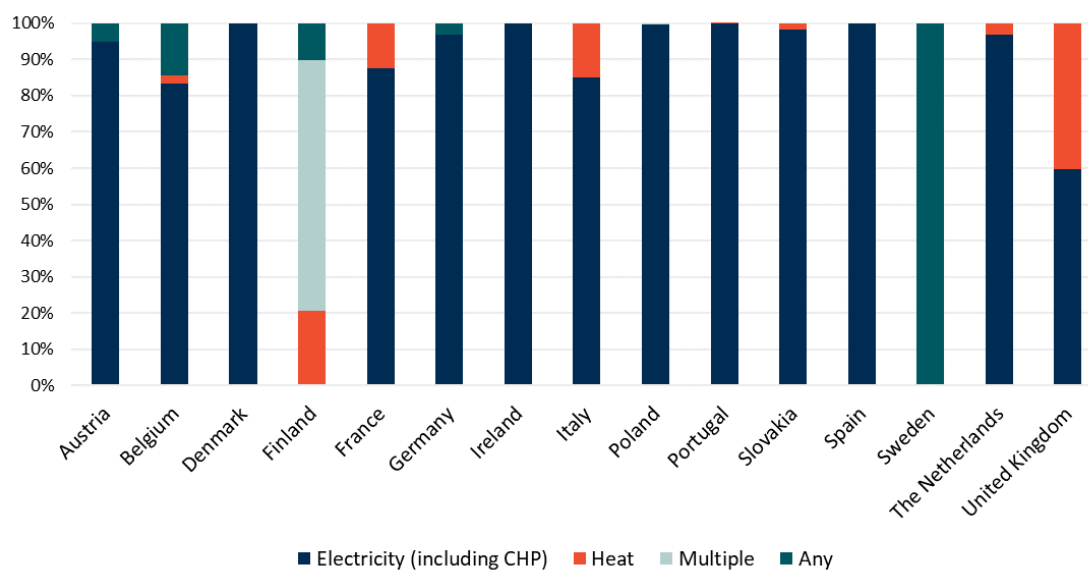
Country	Instrument name	Instrument type	Use	2015	2016	2017	2018	Data source	Calculation approach
Slovakia	Zelena domacnostiam I & II - Kotly na biomasu	Investment subsidies	Heat	148 849	1 165 487	1 290 520	2 316 948	https://zelenadomacnostiam.sk/sk/	N/A
Spain	Special regime for electricity generation - Biomass (energy crops) (Real Decreto 661/2007)	FIT	Electricity	451 168 082	412 887 872	499 433 933	521 058 518	RD 661/2007 of 25th May. Electricity Generated in Special Regime. Source: CNMC	N/A
Spain	Special regime for electricity generation - Biomass (waste / residuos) (Real Decreto 661/2007)	FIT	Electricity	285 060 765	234 676 816	302 460 481	313 077 364	RD 661/2007 of 25th May. Electricity Generated in Special Regime. Source: CNMC	N/A
Spain	Plan de Energías Renovables (PER) 2011-2020	Investment subsidies	Multiple	45 000 000	300 000 000	-	30 000 000	Plan of Renewable Energies (PER) 2011-2020	N/A
Sweden	Electricity certificate system (Elcertifikatsystemet)	Green Certificate - biomass	Any	60 328 004	53 180 887	38 665 216	50 480 812	Swedish Energy Agency	N/A
The Netherlands	Stimulation sustainable energy (SDE+ regeling)	FIP	Electricity	22 200 000	42 200 000	84 900 000		Personal communication with RVO expert Aggregated data available at: https://www.rvo.nl/subsidies-regelingen/stimulerende-duurzame-energieproductie/feiten-en-cijfers/resultaten-2016 ; Jaarbericht SDE & MEP 2009; Jaarbericht SDE & MEP 2010; Jaarbericht SDE & MEP 2011.	N/A
The Netherlands	Investment subsidy sustainable energy (Investeringssubsidie duurzame energie -ISDE)	Investment subsidy	CHP		8 536 831	28 739 220	28 728 000	http://www.rijksbegroting.nl/2015/verantwoording/jaarverslag,kst221658.html ; Vaststelling van de begrotingsstaten van het Ministerie van Economische Zaken (XIII) en het Diergezondheidsfonds (F) voor het jaar 2017	N/A
The Netherlands	Energy investment deduction (Energie Investeringsaftrek - EIA)	Investment support (tax deduction)	Heat	6 487 217	6 497 041	3 643 845	-	http://www.rvo.nl/subsidies-regelingen/energie-investeringsaftrek-eia EIA Jaarverslag 2015 - https://www.rvomagazines.nl/eia/2016/01/index , EIA Jaarverslag 2016 - https://www.rvomagazines.nl/eia/2017/01/gebruikte-energie-technieken , EIA Jaarverslag 2017 - https://www.rvomagazines.nl/eia/2018/01/gegevens-eia-2017 .	N/A

Country	Instrument name	Instrument type	Use	2015	2016	2017	2018	Data source	Calculation approach
United Kingdom	Domestic Renewable Heat Incentive (RHI) payments - biomass	FIT	Heat	49 351 240	59 460 317	53 722 603	55 590 960	https://www.ofgem.gov.uk/data-portal/amount-domestic-rhi-payments-made-under-each-tariff	N/A
United Kingdom	Winter fuel payment - Biomass	Tax incentive	Heat	180 834 586	163 468 678	156 787 189	-	https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2017	Total subsidy * bioenergy share of heating demand
United Kingdom	Non-domestic renewable heat incentive	FIT	Heat	277 509 366	382 328 238	448 889 565	555 426 992	https://www.ofgem.gov.uk/environmental-programmes/non-domestic-rhi/contacts-guidance-and-resources/public-reports-and-data	Total subsidy * bioenergy share of total
United Kingdom	ROCs - Fuelled	Green certificates	Electricity	875 892 154	793 549 822	696 386 458		OFGEM annual reports and https://www.ofgem.gov.uk/environmental-programmes/ro/contacts-publications-and-data/public-reports-and-data-ro	ROCs issued * average value * (tax year split)
United Kingdom	Contracts for difference	FIP	Electricity			283 333 333	363 050 847	https://www.lowcarboncontracts.uk/sites/default/files/publications/11.7.18%20Final%20LCCC%20v%2012%20approved%20by%20NAO%20-proofs.pdf ; Drax power annual reports	N/A

Annex B: Further breakdowns

Table 0-1

Figure B-1 Breakdown of financial support for biomass by energy application, per country, 2017 values



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