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Abstract

This paper asks whether current State aid rules for solid biomass are still fit for purpose and considers the scope for revision of those rules. The paper is structured to present: (i) the rationale and logic of the current State aid regime for support to renewable energy; (ii) the implementation of support for bioenergy deployment since 2005; (iii) the effects of support on markets and the environment; (iv) the relevance of newly adopted policies and policy objectives; and (v) the scope for revision of the rules to better allocate State aid to achieve long-term climate goals. The paper argues that ignoring the external costs of forest biomass use in State aid assessments may lead to a skewed image of its cost-effectiveness as a renewable energy option. This reveals an important discrepancy between the specific way in which biomass support is treated by the current rules and the rationale and objectives of the current State aid regime for renewable energy. Not factoring in external costs of forest biomass may result in an inherently preferential treatment of solid biomass and hinder the development of other – more innovative and cleaner – technologies, which could undermine the principle of technology-neutrality embedded in the Guidelines on State aid for environmental protection and energy (EEAG). This is especially concerning in the case of continuous operating aid for the use of solid biomass as a (close-to) mature technology, which can lead to a lock-in of State aid, of a specific renewable energy technology and of biomass materials for energetic use.

Keywords

State aid; renewable energy; climate; biomass; environment

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This paper was written by Linde Zuidema as part of her Policy Leaders Fellowship at the School of Transnational Governance (STG) at the European University Institute (EUI). Linde Zuidema currently works as a senior policy advisor at Fern, an NGO working on EU policies to protect forests and peoples' rights. She would like to thank the EUI, the European Climate Foundation and the David and Lucile Packard Foundation for their financial support as well as Professor Jos Delbeke for his mentorship throughout this project. Neither these organisations nor Professor Jos Delbeke are responsible for the accuracy or content of this paper. Views expressed do not necessarily express their views.

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Executive summary

Every year, EU Member States spend billions of Euros of public funds on substituting fossil-based energy with solid biomass.

Since the early 2000s, support to biomass under renewables support schemes – primarily in the form of operating aid – has led to a sharp increase in the amount of forest biomass burnt to generate electricity, and for heating and cooling. Current levels of deployment of forest biomass exceed those projected by Member States and the level that is deemed to be compatible with the EU's goal to achieve carbon-neutrality goal by 2050.

This paper asks whether current State aid rules for solid biomass for electricity and heating- and cooling, considering its reliance on forest biomass, are still fit for purpose, and considers the scope for revision. It specifically examines the Guidelines for State Aid for environmental protection and energy (EEAG), which the Commission uses to assess renewables support schemes.

The paper argues that ignoring the external costs of forest biomass use in State aid assessments may lead to a skewed image of its cost-effectiveness as a renewable energy option. Unlike other forms of renewable energy, bioenergy relies on the combustion of carbon and the use of a limited natural resource and is associated with relatively high external costs. Currently, these costs are not adequately mitigated through EU policies or priced-in to current State aid assessments, and thus borne by society at large.

There is an important discrepancy between the specific way in which biomass support is treated by the current rules and the rationale and objectives of the current State aid regime for renewable energy. Not factoring in external costs of forest biomass may result in an inherently preferential treatment of solid biomass and hinder the development of other – more innovative and cleaner – technologies, which could undermine the principle of technology-neutrality embedded in the EEAG. This is further reinforced by the design of the current rules, which allow for continuous operating support for the use of solid biomass for energy as a (close-to) mature technology. This can lead to the lock-in of State aid, of a specific renewable energy technology and of biomass materials for energetic use.

This paper warns that ignoring external costs and allowing for continuous operating aid for forest biomass use may undermine the integrity of the EEAG and the broader aim of allocating resources more efficiently to achieve a cost-effective transition to climate neutrality by 2050.

Recommendations

We recommend the European Commission to consider resolving this in three ways:

1. Assess ways to better mitigate and account for negative externalities – notably greenhouse-gas emissions – from forest biomass use through the upcoming review of relevant climate- and energy policies.
2. Restrict support for forest biomass through relevant EU regulations and funds, including the Renewable Energy Directive, the EU Energy Taxation Directive, the EU Efficiency Directive, and the EU Renewable Energy Financing Mechanism.
3. Adapt the design of the EEAG for support to solid biomass, notably by: (i) Ending operating aid for solid biomass; (ii) integrating a consideration of external costs in the assessment principles; (iii) differentiating conditions for granting aid depending on technological advancement and maturity; and (iv) increasing transparency and scrutiny of support through a variety of support mechanisms to avoid overcompensation.

Introduction

Since the introduction of the Renewable Electricity Directive (2001) and subsequently the Renewable Energy Directive (2009), the EU has promoted the production and consumption of bioenergy as a form of renewable energy to substitute for the use of fossil fuels. This has led to an unexpected increase in the use of forest biomass, the main feedstock used for bioenergy today.

Text box 1: what is bioenergy?

Bioenergy is energy made from materials derived from biological resources ('biomass'), including agricultural crops, short rotation coppices, and residues- and by-products from forestry and agricultural materials, as well as certain waste categories. Biomass is used to produce gas and liquid fuels and can be combusted to generate electricity and heating. End-users range from households, to commercial- and public services, transport and industrial sectors and the energy sector. Biofuels are mostly used in transport, while biogas is mostly used to generate electricity- and heat. Solid biomass is primarily used to generate electricity and heat and provides the largest share of bioenergy today. Today, forest biomass provides around 70 per cent of the feedstock used for bioenergy in the EU (Bioenergy Europe, 2019) and consequently more than 35 per cent of the renewable energy mix.

Increasingly, public support, such as financial incentives, for the combustion of forest biomass for energy is being contested because of the associated greenhouse gas emissions and air pollution, the negative impacts of additional wood demand on forests and on resource-efficiency and concerns over distortion of the raw material market.

Following the adoption of the Clean Energy Package (2019), the Green Deal Communication (2019), and the new Circular Economy Action Plan (2020),[1] the European Commission is currently reviewing State aid rules for renewable energy in order to reflect current policy objectives, including a cost-effective transition to climate neutrality by 2050 and a more circular, efficient use of limited natural resources.

This raises the question of whether current State aid rules for solid biomass for electricity and heating- and cooling, considering its reliance on forest biomass, are still fit for purpose, and whether there is scope for revision.

This paper is structured to present: (i) the rationale and logic of the current State aid regime for support to renewable energy; (ii) the implementation of support for bioenergy deployment since 2005; (iii) the effects of support on markets and the environment; (iv) the relevance of newly adopted policies and policy objectives; and (v) the scope for revision of the rules to better allocate State aid to achieve long-term climate goals.

Rationale and logic of the State aid regime for renewables support

The key element of State aid law is the prohibition on Member States implementing new State aids without notification to and approval by the Commission. Following the Lisbon Treaty, the Commission may adopt regulations to exempt certain categories of aid from the requirement to notify the Commission for approval before granting it.[i] The Commission also lays down guidelines for how the Commission should scrutinise and enforce their State aid powers.

[i] Art. 108 (3) Treaty on the Functioning of the European Union (TFEU). Only when the aid measures or schemes fall within the thresholds and strict conditions of the GBER can MS implement aid without prior control from the Commission; Aid remains subject to ex-post review if not all the conditions of the Regulation were met.

Public support for bioenergy can be through both financial aid and favourable regulatory conditions. In the context of State aid, we are concerned with measures that involve benefits with a monetary value. Financial support to bioenergy does not automatically fall under the definition of State aid. Where it does constitute State aid, depending on the type of measure, it can fall under different State aid rules – including the de Minimis Regulation, the Agricultural Block Exemption Regulation (ABER), the General Block Exemption Regulation (GBER) and Guidelines for State aid for environmental protection and energy (EEAG).[2]

The de Minimis Regulation, the GBER and the ABER exempt certain categories of smaller aid from the notification requirement, including in the field of environment, energy and forestry.[ii] These are directly applicable at national level by domestic authorities. The biggest share of support to solid biomass use for energy is granted under renewable energy support schemes, which usually fall under the EEAG. The EEAG is thus the focus of this paper. In addition to renewable energy support schemes, biomass can be supported through aid for individual projects (including Bioenergy Carbon Capture and Storage (BECCS)) and for high-efficient cogeneration. It can also be supported through energy taxation measures, which fall under the EEAG insofar they are not covered by the scope of the GBER.

The EEAG set out the conditions under which the Commission may consider aid for energy and environmental protection to be compatible with the internal market. They also provide the compatibility criteria for aid schemes and individual aid. To facilitate the Commission's compatibility assessment, the EEAG set out common principles to assess whether aid contributes to the Union's environmental or energy objectives without affecting trade to an extent contrary to the common interest.

These principles are:

1. Contribution to a well-defined objective of common interest in accordance with Article 107(3) of the Treaty;
2. Need for State intervention: the State aid measure is targeted towards a situation where aid can bring about a material improvement that the market alone cannot deliver;
3. Appropriateness of the aid measure: the proposed aid measure is an appropriate policy instrument to address the objective of common interest;
4. Need for an incentive effect to change the behaviour of the undertaking concerned to increase the level of environmental protection;
5. Proportionality of the aid: the aid amount is limited to the minimum needed to incentivise the additional investment or activity;
6. Avoidance of undue negative effects on competition and trade between Member States, so that the overall balance of the measure is positive ('balancing test'); and
7. Transparency of aid.

The Renewable Energy Directive (RED) (2009, revised in 2018) is the basis in secondary law for public support to renewable energy and bioenergy.[3] Its predominant purpose is the environmental aim of reducing greenhouse-gas emissions.[4] While the EEAG are focused on the integration of renewables into the market, in general and with regards to competition between renewable energy technologies, the RED prescribes what forms of renewable energy can be supported and counted towards Member States' renewables targets.

[ii] The de Minimis Regulation considers aid de minimis when the aid is limited to an amount of EUR 200,000 per undertaking over three fiscal years. In that case, the aid falls outside the scope of State aid control so long as the threshold is respected; In the area of renewables, the GBER applies to aid that does not exceed (i) for investment aid: EUR 15 million per undertaking per investment project; (ii) for operating aid: EUR 15 million per undertaking per project and when operating aid is granted under a competitive bidding process EUR 150 million per year for the combined budget of all schemes. Specific rules apply for investment and operating aid, including a description of eligible costs and allowed aid intensities.

Within the EEAG, renewables support falls under the category of 'environmental aid', of which the general objective is to "increase the level of environmental protection compared to the level that would be achieved in the absence of the aid."[5] It follows from the EEAG that the main rationale of State aid for renewables production is to increase the level of environmental protection by compensating for the benefits of renewable energy for as long as the external costs of energy are not effectively priced in.[6] In essence, the State aid guidelines aim to facilitate renewables to compete with other forms of energy sources so as to protect the environment.

In this sense, the EEAG attempt to address market failures in the energy sector that prevent an optimal outcome in terms of environmental objectives, including the negative externality of greenhouse-gas emissions for as long as these are not priced in (e.g. through the EU Emissions Trading System (EU-ETS)). In addition to the deployment of renewables and consequential greenhouse-gas reductions, renewables support schemes are generally expected to promote technological innovation and increased efficiencies, with consequential cost reductions and spill-over effects in the wider market.[7] These objectives have also been a focus of the State aid Modernisation (2012) to ensure better allocation of public resources and better quality of public interventions.[8]

The subsequent revision of the EEAG in 2014 specifically intended to prevent that renewables support leads to excessive distortion on the energy market, notably decreasing support to mature technologies and overall costs of renewables support, while still encouraging innovation. To facilitate a more market-based approach to renewables support, the EEAG now express a clear preference for flexible support schemes such as 'Feed-in-Premiums' that can respond to falling production costs. Compared to fixed 'Feed-in-Tariffs', such flexible instruments are more exposed to price signals and incentivise producers to respond to market developments. The EEAG also suggest that support schemes should gradually be removed as technologies mature, the assumption being that renewables will become competitive between 2020 and 2030.[9] For Renewable Energy Sources for Electricity (RES-E), the premiums should ideally be granted by competitive bidding processes across the EU, open to all RES-E technologies on an equal footing (with an exemption for small installations). Specific exemptions to this principle of technology-neutrality apply on various grounds, including the need for Member States to develop a certain technology, achieve diversification, deal with network constraints and grid stability, or to avoid excessive system integration costs or distortions of the raw material markets from biomass support.[10]

During the 2014 revision of the EEAG, the sustainability criteria for biofuels (for transport) were subject to a legislative review, primarily responding to concerns about negative effects such as Indirect Land-Use Change (ILUC). The revision pre-empted the outcome of this legislative review by prohibiting aid to food-based biofuels post 2020.[11]

In the context of these broader aims of State aid control in the area of renewables support, the specific conditions in the EEAG for support to renewables are relatively lenient towards aid for bioenergy deployment:

1. In line with the principle of technology-neutrality and the rationale behind State aid for RES, the EEAG presume the appropriateness of aid and the limited distortive effects of the aid in the case of all renewables in order to allow Member States to achieve their targets in line with the EU 2020 objectives (§90 and §115-116).
2. However, at the same time, the EEAG still allow for the use of technology-specific support schemes for biomass use for electricity generation, e.g. when there is a need to achieve diversification or because of network constraints and grid stability (§126-127).
3. Support to bioenergy is still allowed through Feed-in-Tariffs for small projects (§125).
4. The EEAG allow for continuous operating aid to be granted to biomass plants after plant depreciation (§132-134).

Providing leniency to support for biomass is often defended because biomass is a dispatchable form of renewable energy and because it is usually dependent on operating aid - unlike other forms of

renewables.[iii] This is connected to another way in which bioenergy is an atypical form of renewable energy: it is the only form of renewable energy that involves burning carbon or that relies on a finite natural resource. As such, bioenergy comes with relatively high external costs and potential distortive effects, even beyond the energy market. This brings up the question of the extent to which a more precautionary approach to State aid for biomass may be warranted. To reflect on this, we first look at the implementation of support to bioenergy, and at the immediate effects in terms of bioenergy deployment.

Implementation of bioenergy support in the EU

To help achieve international commitments to reduce greenhouse gas emissions, the EU has promoted bioenergy as a form of renewable energy since the introduction of the Renewable Electricity Directive (RES-E Directive) and the Renewable Energy Directive (RED), which covered all sectors (electricity, transport, and heating/cooling). Beyond 2020, the revised Renewable Energy Directive (REDII) provides the principle basis for implementation of national support to bioenergy until 2030.[12]

The use of solid biomass for electricity and heating and cooling is also promoted through other EU policies including the Energy Taxation Directive (ETD) and various EU funding programmes such as for forestry, research, demonstration and development (RD&D) and rural development.[13] Plus, the ETS counts (smokestack) emissions from biomass combustion as zero – which means that energy companies benefit from a discharge on payments for carbon allowances.[14] Indirectly, the Energy Efficiency Directive supports the use of solid biomass as the legal basis for State aid for high-efficiency Combined Heat and Power (CHP).[15]

The implementation of these policies has led to support for solid biomass for electricity and heat through a wide range of national level instruments, including renewables support schemes, exemptions on carbon and energy taxation, and direct aid. Measures aim to provide operating support based on production level, investment aid to biomass boilers or electricity installations, subsidies to biomass consumption and support to biomass production or RD&D.

This fragmentation of support instruments complicates efforts to calculate the extent to which overall public resources are allocated to bioenergy. However, available data on the type and level of support to bioenergy provide some insights regarding the type and level of support.

Type of support

Between 2005 and 2015, the most important renewable support mechanisms for the use of solid biomass for electricity production were Feed-in-Tariffs (FIT) and Feed-in-Premiums (FIP), while direct subsidies were the main form of support for bio-heat.[16] The period after 2014 saw a shift towards combining FIT and FIP in tenders to support biomass in the electricity sector, in order to adjust support levels to cost reductions. This combination is being mainly applied for large scale installations. An analysis by Trinomics on biomass support in 15 Member States in recent years found that around half of the instruments for solid biomass provided operating support through renewables support schemes based on the level of production.[17]

[iii] Operating aid is aid which is intended to release an undertaking from costs which it would normally have had to bear in its day-to-day management or normal activities. See, e.g., Case T-177/10, Alcoa Transformazioni v the Commission, EU: T:2014:897.

Level of support

Bioenergy (all sectors)

Between 2005 and 2015 more than a quarter of EU-wide support measures (financial/regulatory) for the development of renewable energy in the EU were dedicated to bioenergy (electricity, heating/cooling and biofuels in transport). The largest share of the financial measures to bioenergy in this period was dedicated to biomass for electricity and 36 per cent for heating/cooling purposes.[18]

Between 2008 and 2016, EU Member States spent a total of EUR 119 billion on the promotion of bioenergy, representing roughly a quarter of all support to renewable energy.[iv] In this period, support to bioenergy steadily increased, from EUR 8 to 17 billion per year. This figure includes a wide range of measures for bioenergy deployment in all sectors (electricity, transport and heating/cooling).[v]

Between 2007 and 2020, Member States spent almost EUR 3 billion on bioenergy through the European Regional Development Fund and the Cohesion Fund, representing one-third of total expenditure on renewables through these funds.[19]

Solid biomass

An increasing share of bioenergy support was dedicated to the use of solid biomass for (commercial) energy generation. The analysis done by Trinomics found that 15 Member States spent a total of EUR 6.5 billion on solid biomass in 2017.[vi] Data from the Council of European Energy Regulators (CEER) shows that 20 Member States spent almost EUR 9 billion per year on solid biomass in both 2016 and 2017.[vii] Trinomics found that from 2015-2017, financial support for biomass electricity accounted for 79-83 per cent of total biomass subsidies, while support to heat accounted for 11-13 per cent of the total**.** In terms of value, operating aid represented 88-92 per cent of the financial support provided in the selected Member States between 2015-2017.

Trinomics found that the share of support to solid biomass (excluding RD&D funds, tax exemptions or support to CHP) in total renewable energy support varies across the 15 investigated countries. The share ranged between 2 and 35 per cent in 2015 and between 5 and 24 per cent in 2016, with seven countries' support to solid biomass representing more than 10 per cent in 2016. The study also indicates that there is generally a correlation between the share of renewables support dedicated to biomass and the share of biomass electricity in gross electricity generation.

Indirect support to cogeneration technology and energy and carbon tax exemptions were not included in these calculations. Trinomics acknowledged tax exemptions can be important for investors' decisions and would have substantially increased the totals.[20] In Denmark and Sweden, the subsidy value for biomass from energy taxation exemptions accounted for EUR 989.1 million and EUR 295.5 million respectively in 2017. Their findings also indicate that the *use* of biomass for heating is less heavily taxed than other energy sources, and in many cases no energy taxes apply at all.

[iv] Report by Trinomics (2018). Study on Energy Prices, Costs and Subsidies and their Impact on Industry and Households. NB several support instruments were excluded from the scope of this research, including sub-national interventions, investment by development banks, and certain tax reductions- and exemptions.

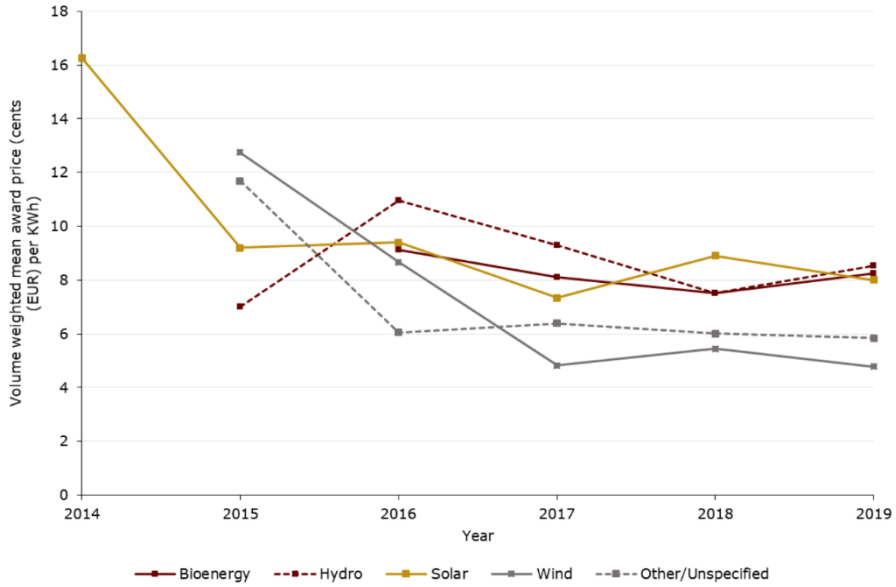
[v] As a result, of all RES-E produced that received support in 2016 and 2017, respectively 23 and 20 per cent was bioenergy (CEER, 2018).

[vi] NB tax exemptions and aid on RD&D were excluded from the scope of this research.

[vii] Calculation based on Status Review of Renewables Support Schemes (CEER, 2018). The 20 EUMS included were: Austria, the Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Croatia, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, the Netherlands, Poland, Portugal, Romania and Sweden.

Data also shows that support levels and support periods per instrument varied significantly across sectors and Member States.[viii] Support levels are usually highest for biomass use in the electricity sector, where they ranged between 54 and 198 EUR/MWh (Megawatt hour).[21] Costs do not seem to decline, as the average level of support for bioelectricity under a FIP scheme was higher in 2017 than in 2014. Support levels in the heating sector varied from 20 EUR/MWhth (Megawatt hour thermal heat) to more than 70 EUR/MWhth.[22] An evaluation of the EEAG for 2014-2019 found that the weighed mean price for bioenergy plants (solid/gaseous) for electricity production did not fall much compared to other RES-E technologies (see Figure 1).

Figure 1: Volume weighted mean price per KWh in sampled schemes split by high-level technology category, 2014-2019[ix]



Source: EEAG Evaluation, final report (European Commission, 2020)

Effects of the support

Level of deployment

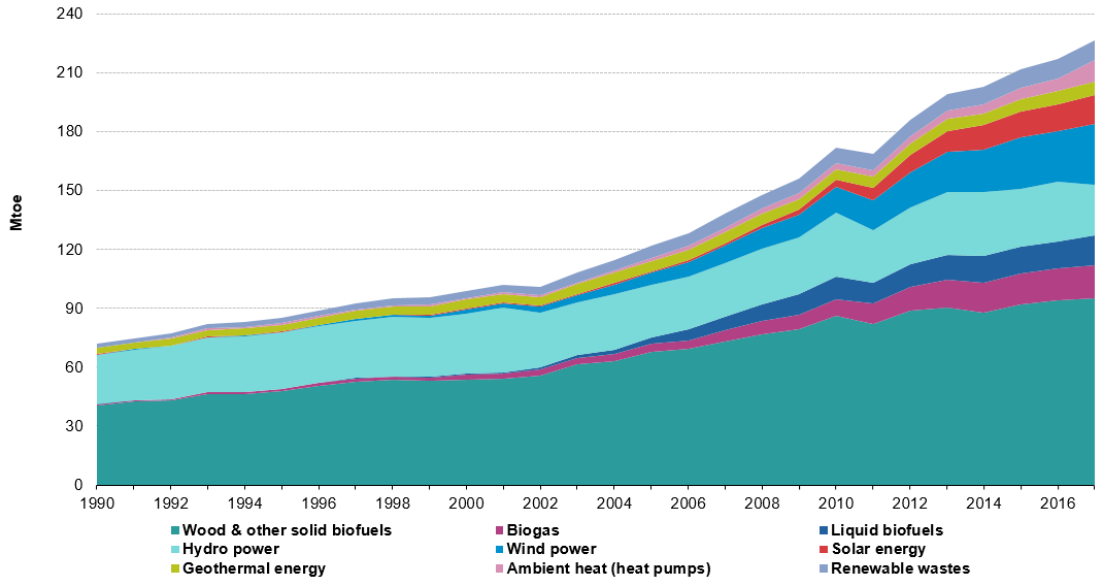
The available literature suggests that there has been a clear correlation in the relationship between support schemes and deployment.[x] Data shows that the average support level for biomass electricity in EU countries resulted in a higher than the average baseload price of electricity, being as such a 'real support'.[23] This has led to a significant increase in the level of biomass deployed in the electricity and heating/cooling sectors (see Figure 2).

[viii] For example, co-firing with biomass receives support for eight years in the Netherlands, while in Italy support can be awarded for up to 30 years, see, Report by E.CA Economics, Centre for Competition Policy and Sheppard Mullin (2020), Retrospective evaluation support study on State aid rules for environmental protection and energy, p. 47. Doi: (European Union, DOI: 10.2763/414004).

[ix] The evaluation study assessed support schemes for RES-E in 17 EUMS: Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Luxembourg, Malta, the NL, Poland, Portugal, Slovenia, Spain, and the UK.

[x] This has been concluded specifically for renewables support schemes that are relevant for bioenergy and not necessarily for other financial support mechanisms in this sector.

Figure 2: Renewable Energy Consumption per technology (EU 28)



Source: Eurostat (2019)

Between 2005 and 2017, the use of wood and other solid biomass for heat and electricity in the EU28 increased by 43 per cent from 66.2 Mtoe (Million tonnes of oil equivalent) to 94.4 Mtoe.[xi] Installed capacity for solid biomass reached 21.2 GW in 2019, compared to 13.3 GW in 2010.[24] In 2017, solid biomass represented 40 per cent of all renewables consumed in the EU28 (total 233.5 Mtoe).[25] Estimates for 2018 show a level of solid biomass use of 95.6 Mtoe.

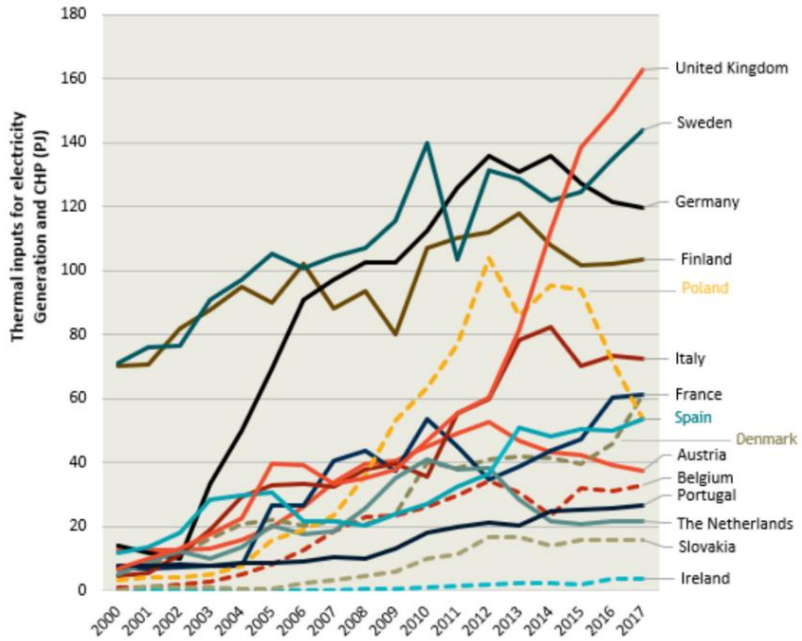
The use of solid biomass increased most in the heating/cooling plant sector (see Table 1), and already surpassed expected levels for 2020 in the National Renewable Energy Action Plans (NREAPs),[xii] while the uptake of other renewables in this sector – notably solar heat, biogas and geo-thermal – fell behind on the projected trajectory towards 2020.[xiii] The increased use of solid biomass for electricity was mainly driven by the expansion of biomass CHP and the conversion of coal-fired power-only plants to biomass installations. The use of solid biomass in electricity and heating plants varies from country to country in terms of growth trajectory and consumption type (see Figure 3).

[xi] Eurostat Supply, transformation and consumption of renewables and wastes. Translated into biomass consumption, this means a growth of 466 PJ (13 per cent) this decade, primarily driven by a rapid expansion (310 PetaJoules) in the power and heating plants sector.

[xii] Renewable heating and cooling represented more than half of all gross final consumption of renewables in 16 EUMS, because of a reliance on solid biomass.

[xiii] Biogas, solar heat and geo-thermal fell behind to expected 2020 levels, while the uptake of heat pumps surpassed the expected 2020 level.

Figure 3: Solid biomass inputs for electricity generation and combined heat and power for the period 2000-2017 (Petajoules)



Source: Financial support for electricity generation & CHP from solid biomass (Trinomics, 2019)

Today, forest biomass is the main feedstock used in the electricity and heating and cooling sectors. In 2017, forest biomass represented 70 per cent of the feedstock used for bioenergy (all sectors).26 Between 2003 and 2016, the use of forest biomass for energy increased from 59 to 82 Mtoe (see Table 2).[27]

Table 1: Solid biomass use, in Electricity and Heating- and Cooling, in Million tonnes of oil equivalent (Mtoe)

Energy	Solid biomass (2005)	Total RES consumption (2005)	Solid biomass (2017)	Total RES consumption (2017)	Share solid biomass (2017)	Increase solid biomass (2005-2017)	Projected use 2020 NREAPs
Heating and cooling	61.7	66.0	84.4	102.2	83%	37%	80.9
Electricity	4.5	42	10.0	86.7	12%	122%	13.5

Sources: European Environment Agency, (Eionet – ETC/CME 2019/8); Commission Staff Working Document SWD (2014) 259 final. NB RES = renewable energy sources.

Table 2: Forest biomass use, compared to estimated projections and potentials, in Mtoe

	2003	2016	Projected use 2020	Potential 2020 Biomass Action Plan*	Potential 2030 Biomass Action Plan*	Potential 2050 Clean Planet for All*
Forest biomass use	59	82	73.6	39-45	39-72	60-65

Sources: Commission Communication COM(2005) 628 final; Commission Staff Working Document SWD (2014) 259 final; Brief on Biomass for energy in the EU (JRC, 2019); Commission Communication COM(2018) 733 final.
* NB These estimates do not include industrial residues from forest-based industries.[xiv]

This increase was not intended. The Biomass Action Plan (2005) had estimated the level of sustainable biomass potential of forest biomass for energy purposes as growing from 39-45 Mtoe in 2020 to 39-72 Mtoe in 2030.[28] In their National Renewable Energy Action Plans, Member States projected that 73.6 Mtoe would be being used by 2020, a level that was already surpassed in 2016.[29] At the same time, the uptake of other biomass feedstocks, such as agriculture and waste, fell behind projections in the National Renewable Energy Action Plans. The current level of the use of forest biomass also exceeds levels outlined in those 2050 EU energy mix scenarios that are compatible with the aim of achieving carbon-neutrality by that year (estimated at 60-65 Mtoe).[30] So in summary, the deployment of solid biomass has exceeded expectations, largely due to the use of forest biomass. At the same time, the use of alternative biomass feedstocks was lower than foreseen.

In assessing whether notified aid is compatible with the internal market, the Commission needs to assess its cost-effectiveness and whether the positive environmental effects of the aid outweigh the potential negative effects on competition and the trade between Member States ('balancing test'). Research indicates that financial support for bioenergy has led to an increase in renewables deployment. This has reduced emissions from avoided fossil fuel use, but since bioenergy also causes emissions, the question is whether it has also been effective towards its broader aim of increasing environmental protection and reducing *net* greenhouse-gas emissions. It also begs the question of the extent to which increased use of forest biomass leads to other negative outcomes, including possible distortions on the renewables or raw material market.

Environmental protection

State aid in the area of renewables attempts to address a market failure by compensating for the fact that external costs of energy are not effectively priced in (e.g. under the ETS, as underlined in §115 of the EEAG), with the ultimate goal of protecting the environment. This brings up the question of how external costs of bioenergy are internalised through EU policies.

Below we briefly discuss the main weaknesses in terms of how greenhouse gas emissions and air pollution were internalised through EU policies in 2011-2020 and will be in 2021-2030. Available assessments suggest these represent the largest share of external costs from solid biomass.[31] Bioenergy can also lead to negative impacts on biodiversity, land-use and efficient resource-use. However, this paper does not aim to discuss all external costs of bioenergy in detail, but merely reflect on the importance of considering them in the context of the EU's State aid control.

[xiv] The current level of deployment also surpasses estimated potentials including industrial residues from the forestry sector (around 15 Mtoe for 2020, see report by Alterra and Intelligent Energy (2012) Atlas of EU biomass potentials).

Greenhouse-gas emissions

Period: 2011-2020

EU renewable energy policies are based on the policy assumption that that use of forest biomass is 'carbon neutral', i.e. that future, additional growth of biomass will compensate for emissions from biomass combustion and will thus provide emission reductions compared to fossil fuels. This assumption has been a topic of extensive scientific debate. Generally speaking, the net carbon impact of the use of forest biomass is understood to depend on many factors, including scale of deployment and resulting harvest levels, the type of feedstock used, the efficiency of energy conversion, and counterfactuals, among others.[32] The Impact Assessment to the REDII indicates that "for forest biomass, the assumption of carbon-neutrality is not generally valid".[33]

The RED (2009) does not include a sustainability framework to mitigate emissions from an increase in biomass deployment or a methodology to assess potential emission savings. The policy framework in this period therefore relies on carbon dioxide (CO_2) accounting mechanisms to internalise emissions and provide incentives to mitigate them (i.e. avoid emissions from burning biomass and/or avoid emissions from an intensification of forest harvesting).[xv]

Emissions from the combustion of biomass in the energy sector are exempted from accounting under the EU ETS, while emissions are reported at the point of harvest in the Land Use Land Use Change and Forestry (LULUCF) sector – in order to avoid emissions from being double counted.[34] This means that emissions in the energy sector do not reflect those from biomass combustion. It is broadly recognised the LULUCF accounting framework (2013-2020) involves certain limitations and does not capture all emissions from biomass use.[35] Another weakness of the current framework is that there is no quantified CO_2 target for LULUCF that contributes to achieving the EU's climate target for 2020.

Period: 2021-2030

The revised REDII (2018) introduces the first sustainability policy for forest biomass use (in installations > 20 MW), in short - a risk-based approach that – at least for domestically sourced biomass – relies on accounting under the LULUCF Regulation and existing rules for sustainable forest management in Member States.[xvi]

The inclusion of the LULUCF sector in the EU's climate target and improved accounting rules ensure better synergy with the zero-rating for biomass emissions under the EU ETS. The new LULUCF Regulation aims to incentivise Member States to increase biomass availability and store biomass carbon in forests. However, it is important to acknowledge that towards 2030 it is only the *increase* in harvest for bioenergy, compared the share of biomass harvests for energy in the reference period 2000-2009 (constant ratio), that is accounted for as a debit towards climate targets. This is problematic, considering the low level of transparency in this sector regarding historic harvest levels and considering – EU wide – the most significant increase in the use of solid biomass for electricity and the heating plant sector took place during this period (see figure 2).[36] Between 2000-2009, reported emissions from bioenergy increased from 274 $MtCO_2$ to 460 $MtCO_2$, while current levels have reached 566 $MtCO_2$ (see text box 2 on page 12 for more explanation).[37] In addition, the current framework does not solve the accounting gap for emissions from the combustion of imported biomass from third countries that do not account for emissions from their land sector.

[xv] It is topic of debate whether LULUCF accounting as such is suitable as a calculation method for assessing the greenhouse gas emissions associated with forest bioenergy; See e.g. Matthews R., Sokka L., et al. (2014). Review of literature on biogenic carbon and LCA of forest biomass, Executive Summary p. ix and p. 80. (Forest Research).

[xvi] The REDII also includes a greenhouse gas savings requirement, and a methodology for its calculation. However, considering that methodology ignores emissions from combustion and forest harvests, it is largely irrelevant for assessing the overall carbon impact of forest biomass.

In conclusion, both under the current framework and the one for the period until 2030, greenhouse gas emissions are not fully internalised by EU policies. At best, this reveals an incoherence between aid to biomass and the rationale for State aid in the area of renewables. At worst, this compromises the objective of common interest and the presumed market failure that aid for biomass attempts to address.

Air pollution

Burning wood also leads to significant air pollution. While renewables overall improved air quality, biomass burning increased pollution since 2005,[38] notably in the heating/cooling plant sector, because of increased levels of NOx, PM10, PM2.5 and VOC emissions.[xvii] This is concerning, since air pollution is considered the biggest environmental risk to health in the EU and associated with significant costs.[39]

The RED (2009) does not provide for a specific mitigation policy for air pollution from biomass and relies on existing ambient air quality standards, national emission reduction commitments and emission and energy efficiency standards for key sources of pollution (requirements for eco-design and combustion plants). While these may certainly mitigate pollution, it is unlikely to be adequate, considering the effect of the RED's incentives for increased biomass use. The EEA speaks of a policy gap and a trade-off between climate and air pollution policies, pointing at the negative impact on air quality from the increased combustion of biomass without adequate emission controls.[40] A report by the Court of Auditors indicates that the RED does not sufficiently reflect the importance of air pollution. In its response, the Commission stated that "*Biomass is not specifically supported by the Renewable Energy Directive. It is up to the Member States to define how they want to meet their national renewables targets, and whether or not to introduce support schemes*."[41]

The Impact Assessment for the REDII recognises that the impact of biomass burning on air pollution is a matter of scale of deployment but indicates that "*given the fact that air pollution from biomass is specifically addressed through other EU measures and regulations, it is not considered appropriate to set specific requirements in the context of this policy initiative*." The bioenergy sustainability framework in the REDII does not include measures to mitigate air pollution from biomass by limiting the scale of its deployment, but it does provide certain efficiency standards for biomass use in large installations.

The importance of governance

While the LULUCF Regulation exposes emissions and removals in the LULUCF sector and can hold Member States accountable, it does not as such prevent excessive harvesting and use of forest biomass (e.g. due to renewables incentives or failing Sustainable Forest Management rules). Similarly, policies on air quality will not prevent air pollution from wood burning that is incentivised through the REDII. This is one of the reasons that requirements in the Governance Regulation aim to prevent competing policy incentives. One example of a competing policy incentive would be if increasing use of forest biomass under the REDII leads to increasing emissions in the LULUCF sector or additional air pollution.[42] The Governance Regulation requires that Member States adopt a National Energy and Climate Plan (NECP), which should include a trajectory on bioenergy use and biomass supply by feedstock and origin towards 2030, and an assessment of the source of forest biomass and the impact on the LULUCF sink. With regards to planned policies and measures, Member States are also required to consider (sustainable) biomass availability and biomass uses by other sectors and to conduct an impact assessment on air pollution. Considering the 'soft law' nature of the Governance Regulation, its effectiveness remains a subject for future analysis.

As shown above, negative externalities of forest biomass use for energy production are closely related to the scale of its deployment. These external costs are amplified because the conversion efficiency of

[xvii] NOx= nitrogen; PM10= particulate matter 10 micrometers or less in diameter; PM2.5= particulate matter 2.5 micrometers or less in diameter; VOC emissions= volatile organic compounds.

Text box 2: Emissions associated with solid biomass

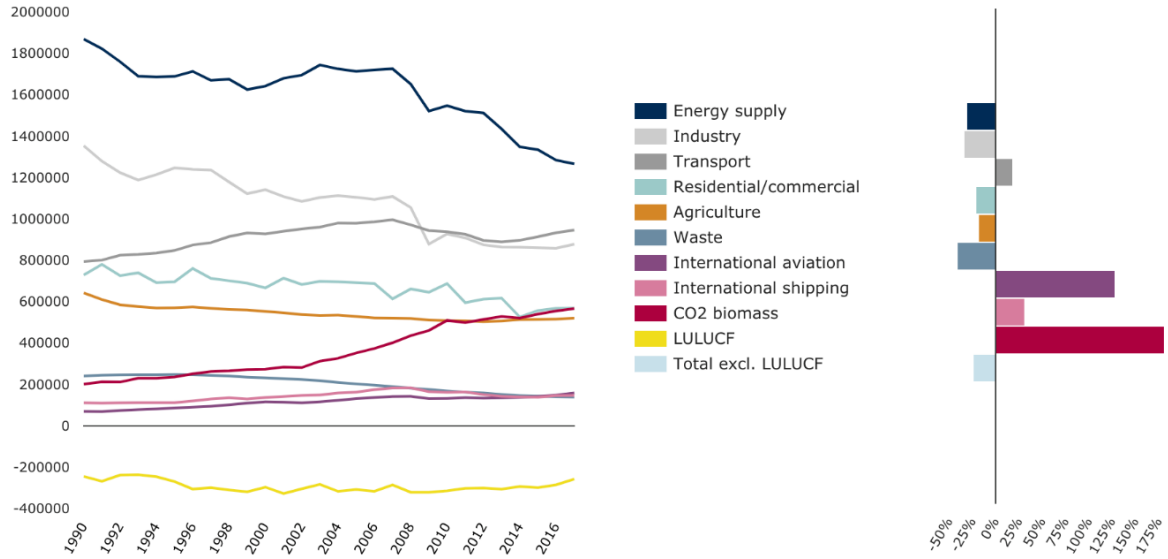
Following the latest EEA report from the European Environmental Agency, renewables consumption achieved a total reduction 423 $MtCO_2$ in emissions from *avoided fossil fuel use* in the electricity and heating/cooling sectors between 2005 and 2016, of which solid biomass use led to 112 $MtCO_2$ of avoided fossil fuel emissions (substitution effect).

At the same time, reported emissions in the energy sector (reported as a memo item in the EU ETS sector only) from biomass combustion between 1990 and 2016 are shown in Figure 4. Between 2005 and 2016 these emissions increased from 352 $MtCO_2$ to 566 $MtCO_2$, exceeding emission levels from the agricultural sector.[i] This data includes all biomass use for heating, electricity and transport, but excludes small CHP and domestic use, and can therefore not easily be compared to the emissions reduction from avoided fossil use. However, from the latest United Nations Framework Convention on Climate Change (UNFCCC) report we conclude that most of this increase was due to the growth in biomass use in the public electricity and heating sector – close to 200 $MtCO_2eq$ between 1990 and 2018 (see correlating lines in Figure 4 and Figure 5). Although forest biomass was the main biomass source used in this sector, this does not automatically mean that the growth in biomass use in this period was exclusively supplied by increased harvests of forests because wood wastes and industrial residue streams are also used.

While biomass *combustion* emissions have increased, the reported trends in net removals from the LULUCF sector show a progressive reduction in the EU LULUCF sink since 2010. While acknowledging modelling uncertainties, it is concerning that under a reference scenario this sink is projected to decline further to about 185 $MtCO_2$ in 2030 – in part due to increased harvests for bioenergy.

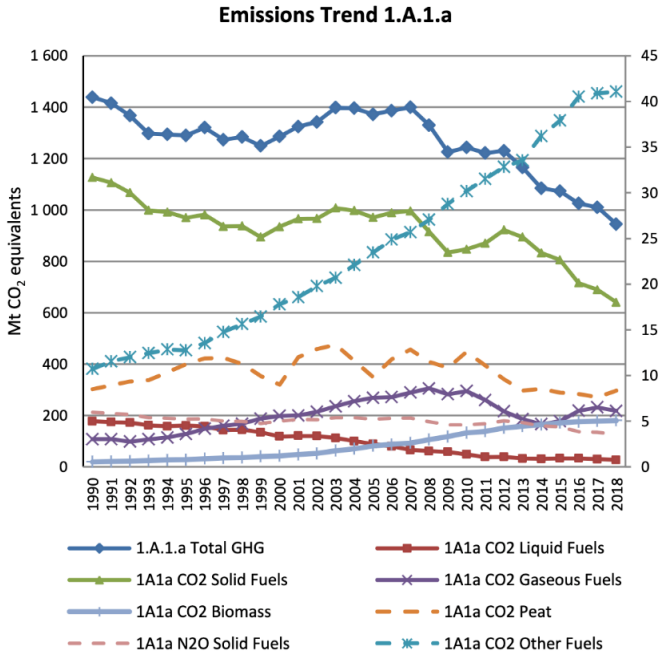
biomass burning is lower than for fossil fuels – using biomass increases the total primary energy consumption and thus worsens the overall conversion efficiency of the energy system.[43] Currently, the scale of biomass deployment and its effect on wider environmental, climate- and energy objectives (net-greenhouse gas impact, air pollution and energy efficiency) are not considered in the assessment criteria provided by the EEAG.

Figure 4: Greenhouse gas emissions by aggregated sector in kilotonnes of CO_2eq



Source: European Environment Agency (EEA, Report No 15/2019)

Figure 5: Public Electricity and Heat production: Total, CO_2 and N2O emission trends



Source: Annual EU greenhouse-gas inventory 1990-2018 and inventory report 2020, submission to the UNFCCC (EEA, 2020)

Market distortion

Depending on its scale, the feedstock-used, and the technology-applied, use of biomass may be a better or worse option for renewable energy deployment. This is relevant for the 'balancing test', in which the Commission needs to assess whether the positive effect of the measure outweighs the potential negative effects on the market.

The purpose here is to examine whether the current EEAG are well designed to assess distortion on the market and nudge the market towards innovation and increased efficiencies. This paper does not foresee a full review of the effects of State aid on different markets, but some reflections following a literature study may be helpful to flag certain dynamics that may call for a revision of the current rules.

Continuous renewables support can be justified in order to allow renewables technologies to mature, while other forms of energy have been able to benefit from a 'learning effect' over the years, with increased efficiencies and decreased costs as a result.[44] For this purpose, the EEAG require – at least for RES-E – that support is granted through market-based mechanisms and based on competitive, technology-neutral bidding procedures. As already mentioned, certain exemptions to this general rule apply that are relevant for bioenergy.

Bioenergy is the oldest source of energy known to mankind, but its level of maturity and innovation potential very much depends on the specific technological application. A large share of all renewables support and most State aid invested in bioenergy is now dedicated to the more mature technologies, i.e. the combustion of forest biomass in boilers for electricity or CHP.[45]

This may lead to distortion between renewable energy options, as support to mature technologies can form a barrier for the deployment of alternative decarbonisation technologies. In the electricity sector, research shows that certain support schemes may have led to a preferential treatment of biomass compared to other RES-E options, by (inefficiently) over-investing in biomass as (the only) low fixed cost technology and underinvesting in high fixed cost technologies.[46] Competitive tendering procedures can also direct aid to larger biomass facilities which benefit from 'economies of scale', thereby

neglecting small-scale options.[47] In the heating sector, the use of solid biomass has increased beyond projected levels, while the development of more innovative technologies has fallen behind. A case study on the financial feasibility of clean heating technologies in Poland found that even after receiving all available subsidies 'biomass is a non-starter'.[48] However, the wider relevance of the design of support mechanisms in the heating sector remains subject for further research.

At the same time, investment in mature technologies may hamper a reduction of overall renewables costs. We've seen above that support levels for the use of solid biomass for electricity have not decreased much, compared to other RES-E. At the same time, production costs of biomass use in power plants in 2030 are expected to be higher than average and thus still dependent on support, which indicates that bio-power is not gradually integrating into the energy market and support is not rolled back as the technology matures.[49] This risks a lock-in of State aid for bio-power at the expense of investment in alternative technologies, which is concerning considering the levels of installed biomass capacities.

This lock-in can have long-term effects, not only on the technology used but also on biomass resource-use. As mentioned above, the increase in bioenergy deployment in the last decade was mainly supplied by forest biomass, while the use of other biomass sources fell behind projected levels. Increasing biomass use for energy is reported to have led to a 'surge in the consumption of woody biomass', and to a shift from material to energy use of forest biomass.[xviii]

Although the Commission does seem to assess potential distortive effects on the raw material market, the scope of these assessments – in particular in the case of aid for individual projects – are limited and may not reveal the full distortive effects of support provided. This also creates a tension with policy aims to use limited resources more efficiently towards long term climate goals and for the development of a sustainable 'circular bioeconomy', where biomass resources can play a role to substitute carbon-intensive and fossil-based products beyond the energy sector.[50]

So far, material shortages in the forest-based sector do not seem to have materialised as a result of State aid for bioenergy.[xix] A structural correlation between bioenergy subsidies and wood prices has not been established either, although research has suggested this is likely to change in the coming decade.[51] There may be two reasons for this (i) Additional demand did not eat into a static demand, while wood demand from competing sectors decreased; (ii) Additional demand was met by increased supply, e.g. by expanding sourcing areas, more intensive management practices and large-scale imports of wood pellets.[52]

The REDII neither restricts the use of forest biomass in quantitative terms nor prioritises the use of certain biomass sources over others. However, the REDII does encourage Member States, when developing support schemes, to "*consider the available sustainable supply of biomass and take account of the principles of the circular economy in order to avoid unnecessary distortions of raw-material markets.*"[53]

[xviii] Research shows that energy accounts for almost half (48%) of the total reported uses of woody biomass in the EU28, an increase compared to the estimated 43% in 2010 and 42% in 2005. See, Camia A., Robert N. et al. (2018). JRC science for policy report: Biomass production, supply, uses and flows in the European Union, p. 41. This report also suggests that the actual energy share of woody biomass is higher, while wood removals for energy are significantly un(der)-reported in the EU.

[xix] Based on interviews with representatives from forest-based industries. Prices of pulp wood and chips from sawmilling industry have not significantly increased, while there have been reports of market distortions in more continental regions of the EU and in niche markets (e.g. wood panels).

Relevance of new policies and policy objectives

In 2015, the EU endorsed the Paris Agreement and the Sustainable Development Goals, which include commitments on climate change mitigation, clean energy, good health, responsible production and consumption, and the protection and restoration of life on land, among others.

Following these commitments, the EU has adopted a 'Clean Energy Package' and related climate regulations for the period 2021-2030,[xx] including revised climate targets: a reduction of greenhouse gas emissions of 40 per cent compared to 1990 levels, a renewable energy target of at least 32 per cent and an energy efficiency target of 32.5 per cent. As discussed, this framework better recognises some of the external costs and potential distortive effects of increased use of forest biomass but does not yet fully internalise or prevent them.

Carbon-neutrality by 2050 and the European Green Deal Communication

In December 2019, the Council of the European Union endorsed the objective of making the EU carbon neutral by 2050, in line with the Paris Agreement. In the same month, the Commission presented its European Green Deal Communication, which – among others – endorses the 2050 target and proposes an increased target of 50-55 per cent greenhouse gas reduction by 2030. This Communication presented a roadmap of the key policies and measures needed to achieve its objectives. These include a Climate Law, to enshrine the 2050 carbon-neutrality target into law, and a review of 'all climate related instruments', including those under the Clean Energy Package.

Following the Green Deal Communication, the Commission is expected to revise the Energy Taxation Directive and the EEAG by 2021. The Communication provides that the EEAG will be revised in 2021 to reflect the policy objectives of the European Green Deal, notably a cost-effective transition to achieve carbon neutrality by 2050 and a phase-out of fossil fuels, ensuring a level playing field in the internal market.

The Commission has already published the new Circular Economy Action Plan (CEAP), which supports the promotion of a sustainable and circular bio-based sector by the implementation of the Bioeconomy Strategy and Action Plan.[54] Among the key actions are a review of the Industrial Emissions Directive as well as efforts to ensure the circular economy objectives are reflected in the revision of the EEAG. The Bioeconomy Strategy itself recognises the role of biomass for energy as well as the need to manage natural resources sustainably and restore ecosystems to ensure a substantial contribution to climate change mitigation. In May 2020, the Commission also published its Farm to Fork Strategy and its Biodiversity Strategy for 2030.[55] Most important for forest biomass – the former includes an initiative for a reward system for carbon removals from the land sector (carbon farming initiative), while the latter includes an initiative for an instrument for forest restoration, an assessment of biomass supply and demand, as well as a study on the sustainability of the use of biomass for energy production.

Other plans under the European Green Deal Communication relevant for bioenergy support include green finance, innovation, a new EU Forest Strategy and measures to support the implementation of the EU Action Plan to Protect and Restore the World's Forests.

Across the board, the European Green Deal Communication acknowledges both the need to enhance forest sinks as well as the role of biomass in the development of a circular bioeconomy.

[xx] Notably, the Renewable Energy Directive (EU) 2018/2001, the EU Emissions Trading System (EU) 2018/410, the LULUCF Regulation (EU) 2018/841 and the Governance Regulation (EU) 2018/1999.

Transition in bioenergy-use towards 2050

The Commission's long-term climate strategy includes scenarios that are compatible with the EU goal of achieving carbon neutrality.[56] All of them include substantial use of biomass for energy, ranging from 190 to over 250 Mtoe by 2050 (the level of deployment in 2016 was 140 Mtoe).[xxi] These scenarios also suggest that the feedstock-mix will need to substantially change compared to the current situation, with a relatively high share of waste, fast growing energy crops and agricultural residues. This provides a specific challenge to decrease the reliance on forest biomass, which currently provides 70 per cent of bioenergy feedstock (82 Mtoe) but is capped at 60-65 Mtoe in the scenarios analysed for 2050.

Sustaining the current consumption level of forest biomass for bioenergy production is incompatible with the aim of achieving carbon neutrality by 2050.[57] The main reason is that forest carbon sinks will need to increase – which implies restrictions on forest harvests and changes in management practices. This restricts the use of forest biomass for energy.

This outlook towards 2050 thus creates a challenge to use the limited available forest biomass resources where this results in the most efficient outcomes across sectors, while diversifying the feedstock use for bioenergy production and increasing market share of other renewable energy technologies.

Scope for revision of the State aid rules

Conclusions

This review of the effectiveness of State aid rules for bioenergy support in terms of promoting the environmental protection and mitigating excessive market distortions, reveal a discrepancy between the wider objectives of the current State aid regime in light of State aid Modernisation and the specific conditions for support to renewables and bioenergy.

The EEAG are designed to increase environmental protection while lowering support costs overall, and to better integrate renewables into the market. Key features of the EEAG that aim to achieve this are the requirement to use market-based support mechanisms in combination with a technology-neutral, competitive-bidding process for RES-E support. As shown in this paper, bioenergy benefits from certain exemptions to this general approach as well as from other State aid conditions for renewables support.

In the last decade, financial support has facilitated an increase in biomass deployment. Support to the use of solid biomass for electricity and heating has steadily increased, mostly in the form of operating aid. Research further establishes a clear correlation between the share of support for solid biomass and the share of biomass use for electricity generation. This support has led to increased renewables consumption and triggered an unexpected use of forest biomass.

The main rationale for State aid for renewable energy production, however, is to increase the level of environmental protection by compensating for the benefits of renewable energy for as long as the external costs of energy are not effectively priced in. Yet current State aid rules do not allow for an assessment of the compatibility of aid for bioenergy with EU law that gives full consideration to the external costs of bioenergy itself.

This is problematic considering the atypical characteristics of bioenergy as a form of renewable energy, as it relies on the combustion of carbon and the use of already limited natural resources. Bioenergy – notably wood burning – also comes with high external costs compared to other forms of renewable energy, largely due to its associated greenhouse gas emissions, air pollution and health-care related costs. These are dependent on the scale of deployment, type of feedstock-use and technology applied.

[xxi] Malins C. (2020). We didn't start the fire – the role of bioenergy in decarbonisation scenarios (Cerulogy) shows different scenarios with varying levels of EU final bioenergy demand between 50 and 250 Mtoe.

Currently, these costs, which are additional to the public costs of the State aid measure itself, are not fully mitigated through other EU policies and thus the expense in borne by society at large.

While State aid has increased the use of forest biomass and reduced emissions from *avoided* fossil fuel use, its net-effect in terms of greenhouse gas savings is uncertain.[58] The current State aid regime does not foresee a full assessment on the net-greenhouse gas effect of bioenergy, as it ignores the most significant emission factors, i.e. those from biomass combustion and forest harvests.

This undermines the integrity of EEAG, as ignoring positive or negative external costs of renewable energy technologies in State aid assessments may result in a skewed assessment of the cost-effectiveness of measures to benefit the common interest. As such, it may affect the result of the balancing test, in which the Commission assesses whether the negative effects of the aid measures in terms of distortions of competition and impact on trade between Member States are limited and outweighed by the positive effects in terms of environmental protection.

In this 'balancing test', the Commission should in principle consider the overall environmental effects of the measure in relation to its negative impacts on the market: the lower the expected environmental effect of the measure, the more important the verification of its effect on competitors, such as those of other renewable energy providers. The rationale being that a potential harmful effect of State aid is that it forms a barrier to more efficient and innovative competitors - with a cleaner technology - to increase their market share.[59] Not internalising external costs may thus lead to preferential treatment for bioenergy and hinder the development of other – more innovative and cleaner – technologies, which can undermine the principle of technology-neutrality embedded in the EEAG.

At the same time, – on the other side of the spectrum – market developments provide ample reasons to question whether the current EEAG sufficiently encourage the Commission to assess potential distortive effects of aid to bioenergy on the renewables or raw material markets. This paper specifically discussed the concern that certain (close-to) mature bioenergy technologies remain dependent on continuous (operating) support, which can lock-in State aid, a specific renewable energy technology and the energetic use of biomass materials.

In this context, it is difficult to justify the current leniency in the EEAG for support for bioenergy. Even without factoring in external costs, the production costs for bio-electricity by 2030 will far exceed alternative RES-E technologies, meaning the level of support will be relatively higher. Without a comprehensive assessment of all the costs associated with bioenergy and effects on market distortion, State aid may lead to excessive societal costs and may thus contradict the objective of allocating resources more efficiently and the objective of improving the quality of State aid interventions. We thus conclude a more precautionary approach to State aid for bioenergy is warranted.

Need for a future-oriented State aid regime

State aid is policy-driven, not policy driving: While the REDII prescribes what forms of renewable energy can be supported and counted towards Member States' renewable energy targets, the EEAG are focused on the integration of renewables into the market. In this sense, it is the principal role of the climate- and energy regulations to mitigate the external costs of forest biomass, which we recommend that the Commission pay attention to in its planned review of these regulations in order to achieve carbon neutrality by 2050, as outlined under the European Green Deal Communication.

In terms of policy revisions, there is clear momentum to shift gears and direction. Increased climate ambition requires a long-term vision of an energy transition, a different approach to management of land and forests and a conscious use of limited biomass resources. Policies should aim to enhance carbon removals, including from land through improved management practices and the restoration of forests. Restrictions on support for the use of forest biomass for energy can facilitate a more sustainable and circular use of wood, while benefiting the climate, biodiversity levels and air pollution.

The Commission may wish to consider:

- Ensuring emissions from the use of forest biomass for energy are *fully* accounted for through the EU's emissions accounting framework;
- Applying restrictions on the support for and use of forest biomass under the Renewable Energy Directive, and where appropriate, under the Energy Taxation Directive, the Efficiency Directive and EU funds;
- Encouraging Member States to prioritise reducing energy demand (notably for heating/cooling) as well as the market-integration of more innovative renewable energy technologies.

For as long as external costs of forest biomass are not internalised in full through EU climate and energy policies, such as by means of adequate accounting rules or quotas, the burden is on the State aid regime to somehow integrate a consideration of external costs in its assessment principles to avoid undue distortions in the renewables and raw materials markets.

It follows from the European Green Deal Communication and the new Circular Economy Action Plan that the future EEAG will be revised to reflect the new policy objectives, including a cost-effective transition to carbon neutrality by 2050 and efficient use of limited resources. The REDII already encourages Member States to take a long-term vision when designing support schemes and allocating support, and to minimise the overall costs of renewables deployment along the decarbonisation pathway to 2050. At the same time, the REDII re-affirms the discretion of Member States in the design of support schemes. Generally, this is understandable from the perspective that Member States should be able to adapt policies and measures to national circumstances. However, this could also allow Member States to increase their reliance on forest biomass in order to increase renewable energy consumption.

While the Commissions' analysis for its long-term climate strategy includes an increasing role for bioenergy, it also shows that the role of forest biomass is severely restricted. This means the Commission must increase scrutiny on aid to solid biomass, to avoid inefficiencies in the long run. It should be subject to further debate about the extent to which harmonisation of support can facilitate better scrutiny, or whether increased coordination and governance between Member States and between Member States and the Commission would suffice.

Recommendations:

The 2021 Guidelines should build on its predecessor, while taking a more precautionary approach to aid for forest biomass, seeking alignment with the new Climate and Energy Framework for 2030 and the long-term climate ambition of the EU. We recommend focussing on four aspects:

1. **Discontinuing operating aid for the use of forest biomass.** Further allowing operating aid for forest biomass for electricity and heating/cooling is no longer justified, considering the aim to decrease the cost of renewables (for mature technologies) as well as the notion that the current level of forest biomass deployment is incompatible with the goal of achieving carbon neutrality by 2050. Support should be re-directed to facilitate the development of more innovative technologies that contribute to an energy transition for the long-term.
2. **Ensuring aid exclusively enables activities that face real market-failures.** State aid rules should take a more holistic approach to aid for solid biomass and increase scrutiny of the potential external costs and distortive effects of the projected increase in deployment. Here, the Commission could seek alignment with the Governance Regulation and its requirements for providing transparency on the use of solid biomass through Member States' NECPs, e.g. by restricting support when (a lack of) information in the NECP provides reason to do so.
3. **Differentiating conditions for granting aid depending on technological advancement and maturity.** This would avoid locking in State aid that can structurally distort the market and form a barrier to cleaner alternatives and innovation. Concretely, the Commission should

consider restricting the possibility for forest biomass to compete on an equal footing in open tendering procedures for as long as external costs are not adequately priced-in. The Commission could also make access to (technology-specific) support schemes conditional to the level of maturity of the technology, the sizes and types of installations, or restrict schemes to overall capacity levels.

4. **Increasing transparency and scrutiny of support through a variety of support mechanisms to avoid overcompensation.** Support instruments for solid biomass are severely fragmented, which complicates their ability to analyse the full scope of incentives and their effectiveness in achieving policy objectives. More transparency and scrutiny on support instruments is needed to avoid that forest biomass can benefit from a proliferation of support options, which could lead to further distortions in the renewables and raw material markets.

References

[1] The Clean Energy for all Europeans Package (2019) consists of eight legislative acts, including on energy performance of buildings, renewable energy, energy efficiency, governance and market design; Communication from the Commission COM(2019) 640 final, the European Green Deal; and Communication from the Commission COM (2020) 98 final, a new Circular Economy Action Plan.

[2] Commission Regulation (EU) No 1407/2013, On the application of Articles 107 and 108 of the TFEU to de minimis aid, OJ L 352, 24.12.2013, p. 1; Commission Regulation (EU) No 702/2014 Declaring certain categories of aid in the agriculture and forestry sectors and in rural areas compatible with the internal market in application of Articles 107 and 108 of the TFEU ("ABER"), OJ L 193, 1.7.2014, p. 1-75; Commission Regulation (EU) No 651/2014 Declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the TFEU ("GBER"), OJ L 187, 26.6.2014, p. 1-78; Communication from the Commission – Guidelines on State aid for environmental protection and energy 2014-2020 ("EEAG"), OJ C 200, 28.6.2014, p. 1-55.

[3] Directive 2009/28/EC on the promotion of the use of energy from renewable sources, OJ L 140, 5.6.2009, p. 16.

[4] Sacker, Scholz, Sveen (Eds.) (2015). Renewable energy law in Europe: Challenges and perspectives. Peter Lang Academic Research. Chapter: Sveen, The interaction between Article 192 and 194 TFEU: Renewable energy promotion with a predominant environmental purpose, p. 142.

[5] § 30 EEAG.

[6] § 35, § 115 EEAG; See also, Hancher, de Houteclocque, Salerno (Eds.) (2018). State Aid and the Energy Sector. (Hart Publishing). Chapter: Salerno, et al. Compatibility of RES: A legal and economic approach, p. 113-145.

[7] Commission Staff Working Document, European Commission guidance for the design of renewables support schemes, SWD(2013) 439 final.

[8] Communication from the Commission COM(2012) 209 final, EU State Aid Modernisation (SAM).

[9] § 108-109 EEAG.

[10] § 126 EEAG.

[11] § 113 EEAG; See also, Directive (EU) 2015/1513 relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, ("ILUC Directive"), OJ L 187, 26.6.2014m p. 1-78.

[12] Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market, OJ L 283, 27.10.2001, p. 33-40; Directive 2009/28/EC on the promotion of the use of energy from renewable sources, OJ 140, 5.6.2009., p. 16-52; and Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources, OJ L 328, 21.12.2018, p.82-209.

[13] Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity ("Energy Taxation Directive"), OJ L 283, 31.10.2003, p. 51-70.

[14] Directive 2009/29 so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community ("EU Emission Trading System Directive"), OJ L 140, 5.6.2009, p. 63-87; its successor is Directive (EU) 2018/410 to enhance cost-effective emission reductions and low-carbon investments ("EU ETS Directive"), OJ L 76, 19.3.2018, p. 3-27.

[15] See, e.g., Report by E.CA Economics, Centre for Competition Policy and Sheppard Mullin (2020), Retrospective evaluation support study on State aid rules for environmental protection and energy, p. 56 and Annex 3.1. Doi: (European Union, DOI: 10.2763/414004).

[16] Banja, Sikkema, et al. (2019). Biomass for energy in the EU: The support framework (Elsevier, Energy Policy, volume 131, 2019, p. 215-228); Banja, Jégard, et al. (2017). Renewables in the EU: The support framework towards a single market – EU countries reporting under Article 22(1) b, e and f of Renewable Energy Directive. EUR 29100 EN (European Union, doi10.2760/521847); Council of European Energy Regulators (CEER) (2018). Status Review of Renewables Support Schemes in Europe for 2016 and 2017. Ref: C18-SD-63-03. (CEER). NB The CEER report indicates that its members provided the following support mechanisms in 2016-2017: 17 FITs, 17 FIPs, 6 Green Certificates, and 1 Investment Grant to support biomass.

[17] Report by Trinomics (2019). Financial support for electricity generation & CHP from solid biomass.

[18] Banja, Sikkema, et al., supra note 16.

[19] Report by the European Court of Auditors (2019). Wind and solar power for electricity generation: significant action needed if EU targets to be met. (European Union, doi:10.2865/394757).

[20] Report by Trinomics, supra note 17.

[21] Banja, Sikkema, et al., supra note 16; Report by E.CA Economics, Centre for Competition Policy and Sheppard Mullin, supra note 15. NB This report indicates a support cost range between 69 – 124 EUR/MWh and suggests a correlation between the level of aid per KWh and the type of bidding process.

[22] Banja, Sikkema, et al., supra note 16.

[23] Banja, Sikkema, et al., supra note 16.

[24] Data retrieved from the online data tool from IRENA Bioenergy, EU28 (incl. the UK).

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[58] Capizzi, Das, et al., supra note 26.
[59] § 91 EEAG.