CORE THEME 4

Biomass Mobilisation and Sustainability

This project has received funding
from the European Union's Horizon 2020
research and innovation programme
under grant agreement N° 734137

TABLE OF CONTENTS

Authors

Olivier Squilbin, GreenSkill, Belgium
Timo Gerlagh, RVO, Netherlands
Leonardo Barreto, AEA, Austria
Anna Kassai, AEA, Austria
Shruti Athavale, AEA, Austria

Date

September 2020

CA-RES CONCERTED ACTION RENEWABLE ENERGY SOURCES DIRECTIVE

1 IN A NUTSHELL

Building on the progress achieved in the second phase of the Concerted Action, the Core Theme on Biomass Mobilisation and Sustainability of the third phase of the Concerted Action (CA-RES3) focused on specific topics requiring a better exchange of information or experiences between participating countries to help increase the use and production of sustainable (solid and gaseous) biomass fuels in the heating/cooling and electricity sectors and their trade, while increasing efficiency. Therefore, discussions around remaining barriers and challenges, and on good practices and the implementation of policies, were a crucial part of the plenary sessions within this CA-RES phase.

Participants analysed methods to improve the competitiveness of their priority bioenergy sectors (existing and future) and the mobilisation of domestic biomass, while also looking at biomass waste mobilisation strategies related to the circular economy and in particular their contribution to a significant increase of the biogas potential. CT4 participants explored the concept of solid biomass exchange platforms and whether its development could lead to more efficient local biomass markets and biomass trade inside the European Union (EU). The increasing role of biomethane was also discussed during specific sessions as well as the need for a better assessment of the role of bioenergy in providing flexibility options on the energy markets.

The sustainable sourcing of biomass is a requirement for bioenergy to be accepted currently and, as such, participants addressed concerns related to this topic. Specifically, new criteria applied to biomass fuels produced from agricultural and forest feedstocks (including LULUCF criteria), as well as criteria on reducing greenhouse gas emissions from the use of biomass fuels, were discussed within the CT4 sessions. Moreover, discussions focused on methodologies and tools to demonstrate compliance with the sustainability criteria, the compatibility of current (national/voluntary) sustainability schemes for solid, liquid and gaseous biomass, the possibilities for harmonised sustainability verification systems and the impacts of new legislation on existing bioenergy installations. Specific issues (mass balance system) regarding the international trade of biomethane injected into the gas grid were also discussed.

Reporting obligations on biomass supply are a crucial part of the Renewable Energy Directive and the Governance Regulation. Member States recognised the need to improve the reliability and quality of these reports by an exchange of methods, so as to report biomass data in a harmonised way with statistically reliable data. In close cooperation with EUROSTAT and the JRC for data collection, a set of recommendations was drafted by a task force on biomass availability in the next decade.

As a result of the in-depth discussions, participants gained a deeper understanding of different policy options and approaches as well as good practices in other participating countries to increase the use and production of sustainable bioenergy sources and their trade, while increasing efficiency. Furthermore, the Core Theme participants received updates on the policy developments at national as well as EU level and identified common challenges and solutions.

2 TOPIC IN THE SPOTLIGHT

Sustainability and Greenhouse Gas Emissions Saving Criteria for Biomass Fuels

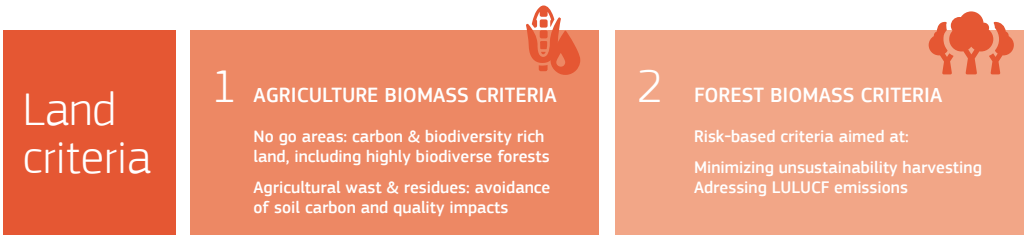
In the context of the RES Directive 2009/28/EC, biomass fuels could be used for electricity or heat generation with or without verification of compliance with sustainability requirements. The new Renewable Energy Directive 2018/2001 (RED II) introduced sustainability and greenhouse gas emissions saving criteria for biomass fuels used in the electricity sector and in the heating and cooling sector, in order to ensure high greenhouse gas emissions savings, avoid sustainability impacts and promote the internal market.

Sustainability compliance is needed for bioenergy consumed in the EU to be:

- counted towards the EU renewables target and the Member States' renewable energy contributions and sectorial targets;
- used for compliance with sectorial renewables targets & obligations; and
- eligible for financial support by Member States

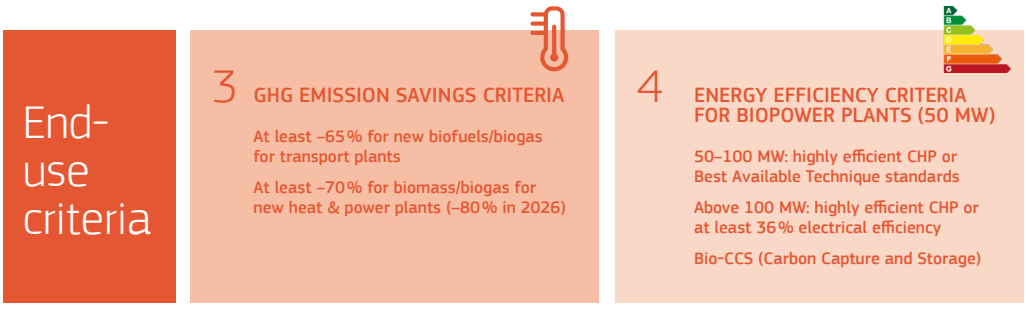
Land criteria for agricultural and forest biomass (Figure 1) as well as end-use criteria comprising GHG savings criteria and efficiency criteria for biomass-based power plants (Figure 2) have been outlined.

FIGURE 1 EU Bioenergy Land Criteria Post-2020



DG ENER, 2019

FIGURE 2 EU Bioenergy End-use Criteria Post-2020



DG ENER, 2019

Land criteria apply to all agricultural and forest biomass (products and primary residues directly generated by agriculture, aquaculture, fisheries and forestry), but not to processing residues (e.g. sawdust) or waste (e.g. wood waste). Land criteria apply independently of final use (transport, heating/cooling and power) and irrespective of the geographical origin of the biomass.

According to the RED II, the greenhouse gas emission savings from the use of biofuels, bioliquids and biomass fuels will be:

a) at least 50% for biofuels, biogas consumed in the transport sector and bioliquids produced in installations in operation on or before 5 October 2015;
b) at least 60% for biofuels, biogas consumed in the transport sector and bioliquids produced in installations starting operation from 6 October 2015 until 31 December 2020;
c) at least 65% for biofuels, biogas consumed in the transport sector and bioliquids produced in installations starting operation from 1 January 2021; and
d) at least 70% for electricity, heating and cooling production from biomass fuels used in installations starting operation from 1 January 2021 until 31 December 2025 and 80% for installations starting operation from 1 January 2026.

Unlike biofuels and biogas consumed in the transport sector, the greenhouse gas emissions saving criteria for electricity, heating and cooling only apply to new installations starting operation from 1 January 2021.

The EU criteria do not apply to small-scale installations producing heating/cooling, electricity from biomass, and fuels (which means biogas and biomethane, including liquefied biomethane). Biomass fuels must fulfil the sustainability- and greenhouse-gas-emission savings criteria laid down in Article 29 of the RED II, only if used in installations producing electricity, heating and cooling or fuels with a total rated thermal input equal to or exceeding 20 MW in the case of solid biomass fuels, and with a total rated thermal input equal to or exceeding 2 MW in the case of gaseous biomass fuels.

Energy efficiency criteria only apply to electricity from biomass fuels produced at new installations with a total thermal input above 50 MW as follows:

- for installations with a total rated thermal input from 50 to 100 MW, electricity from biomass fuels is produced by applying high-efficiency cogeneration technology or, for electricity-only installations, by meeting an energy efficiency level associated with the best available techniques (BAT-AEELs) as defined in Commission Implementing Decision (EU) 2017/1442; and
- for installations with a total rated thermal input above 100 MW, electricity from biomass fuels is produced by applying high-efficiency cogeneration technology or, for electricity-only installations, by achieving a net-electrical efficiency of at least 36%.
- it is produced applying biomass CO_2 capture and storage (Bio-CCS).

Unlike biofuels and biogas consumed in the transport sector, additional sustainability requirements (land and end-use criteria) for biomass fuels are still possible at MS level as well as various options for compliance verification. For biomass fuels, therefore, a full EU harmonisation is not yet achieved under RED II. For example, Member States may apply higher energy efficiency requirements for biopower, apply energy efficiency requirements to installations with lower rated thermal input or extend the application of end-use criteria to existing installations.

The introduction of sustainability criteria for biomass fuels could lead to a change in the level of use of these biomass fuels and could impact the "economic sustainability" of existing bioenergy installations. In addition, since the criteria differ according to the type of biomass and the size of the plant, the impacts could be different for the different biomass fuels and they differ across Member States. The expected effects on local markets mainly concern agricultural biomass, forest biomass and energy crops.

New criteria applied to biomass fuels produced from agricultural and forest feedstocks (including LULUCF criteria), as well as criteria on reducing greenhouse gas emissions from the use of biomass fuels, were discussed in Core Theme 4 sessions. Moreover, methodologies and tools to demonstrate compliance with the sustainability criteria, the compatibility of current (national/voluntary) sustainability schemes for solid, liquid and gaseous biomass, possibilities for harmonised sustainability verification systems and the impacts of new legislation on existing bioenergy installations were addressed. There are several issues to be incorporated into the voluntary schemes such as the fact that forestry supply chains differ from the agricultural supply chains and that the regional approach is more efficient, as well as the possibility for MS to add sustainability requirements for biomass fuels.

Discussions focused, among others, on the European Commission guidance document in preparation for the implementation of new risk-based sustainability criteria for forest biomass laid down in Article 29(6) - harvesting criteria and 29(7) – LULUCF criteria – of RED II. Preliminary results from the DG ENER technical assistance project REDIIBIO were presented. The objective of the REDIIBIO project is to provide technical assistance to the European Commission and Member States on the harmonised and correct implementation of the new EU sustainability criteria for forest and agricultural biomass (especially residues) used for energy generation, as set out in Article 29 of the RED II. In order to better understand the complexity at national level, Hungary also presented its strategy on forest management and its sustainable criteria for forestry in order to guarantee long-term sustainability. One of the participants' main recommendations is to build on existing sustainable forest management systems that are already widely implemented across the EU.

Sustainability criteria for agricultural biomass were also addressed, in particular the European Commission guidance document in preparation for the implementation of the new sustainability criteria for agricultural biomass laid down in Article 29(2) for waste and residues and 29(3)(b) for highly bio-diverse forests. According to Article 29(2), biomass fuels produced from waste and residues derived from agricultural land are taken into account for the target achievement only where operators or national authorities have monitoring or management plans in place to address the impacts on soil quality and

soil carbon and cannot be made from raw material obtained from land with a high biodiversity value, according to the categories identified by the directive (Article 29 (3)). Exceptions apply provided that certain evidence is produced (highly biodiverse forests, protected areas, highly biodiverse grasslands).

During the CT4 parallel sessions, results from the REDIIBIO project were presented and questions were addressed to the participants, including methodologies and tools to assess and demonstrate compliance with the sustainability criteria, so as to stimulate discussions with all CT4 participants. One of the participants' main recommendations is to rely more on existing evidence from CAP and LULUCF regulations.

Furthermore, discussions during CT4 sessions covered topics related to verification of compliance with sustainability and greenhouse gas emissions reduction criteria (Article 30, RED II), especially for solid biomass for electricity and heat. Where biofuels, bioliquids and biomass fuels, or other fuels that may be counted towards the RES target, are to be taken into account for the RES target, the renewable obligations or financial support, Member States shall require economic operators to show that the sustainability and greenhouse gas emissions saving criteria laid down in Article 29(2) to (7) and (10) have been fulfilled, using a mass balance system. RED II specifies more clearly that this system must ensure that each consignment is counted only once for the purposes of calculating the gross final consumption of energy from renewable sources and includes information on the type of support scheme, if any, provided for the production of that consignment. As mass balance is part of the certification carried out by voluntary systems recognised by the European Commission and by national systems, the best way to interact between these two systems was discussed.

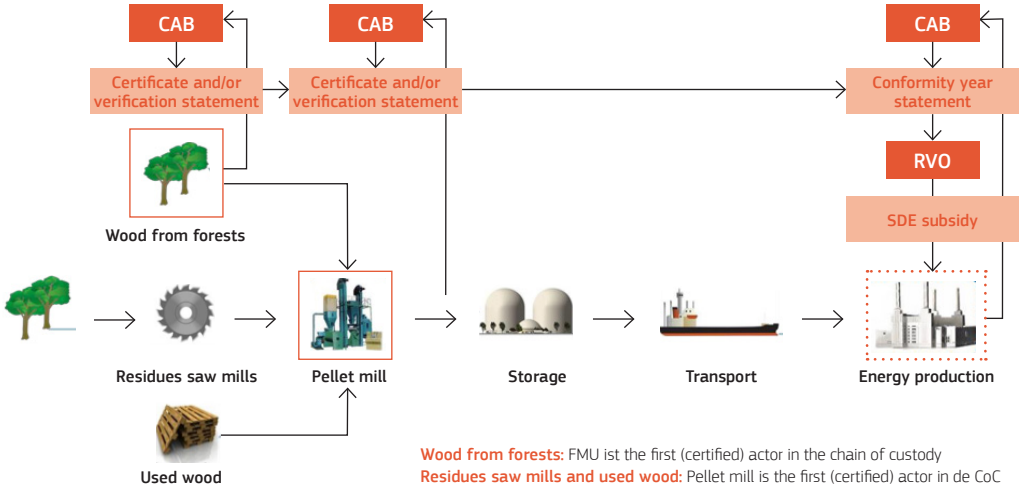
Member States (MS) are responsible for the implementation of the new sustainability criteria and their verification. The sustainability evidence provided by economic operators shall be reliable and third-party audited. Economic operators are required to use a "mass balance" chain of custody system.

There are two options for economic operators to demonstrate sustainability compliance:

- Providing the relevant national authority with data/evidence under a national system; and
- Using voluntary (market-based) schemes recognised by the European Commission.

During the sessions, pre-existing or developing national schemes were presented by some Member States (Denmark, Finland, The Netherlands) and the potential impacts of the implementation of RED II were discussed. These national systems can also use and recognise voluntary schemes. Existing voluntary schemes were also invited to present their strategy for complying with RED II.

FIGURE 3 Example of a National Scheme – The Netherlands – Chain of Custody Principles for passing on Sustainability (Information RVO, 2019)



CAB: Conformity Assessment Body

The RED II empowers the European Commission to recognise voluntary schemes (i.e. certification schemes) that demonstrate compliance with the new EU bioenergy sustainability criteria. There are currently 14 voluntary schemes recognised by the European Commission but limited to biofuels for the transport sector (RED sustainability criteria). In the short term, some of them should broaden their scope to include biomass fuels used for heating/cooling and power sectors. Other existing systems not yet recognised by the European Commission, but already covering the certification of biomass fuels (mainly forest biomass) intended for use in voluntary bioenergy markets, should also apply for recognition. The whole process, including recognition by the European Commission, should in principle be operational by 1 July 2021.

The competent authorities of the Member States shall supervise the operation of certification bodies conducting independent auditing under a voluntary scheme recognised by the Commission. Certification bodies shall submit, upon the request of the competent authorities, relevant information necessary to supervise the operation. During the Core Theme sessions, open questions on how Member States might want to implement the supervision of certification bodies were discussed and experiences were shared, in combination with the Core Theme 5 (RES for the transport sector), in particular in relation to certification bodies operating outside the EU.

The European Commission provided clarification on these and other details of the sustainability and verification articles regarding the use of existing frameworks for sustainability and requirements for efficiency. Further, sustainability governance, mass balance and the market risk of using non-sustainable biomass sources were discussed during the CT4 parallel sessions.

3 CHALLENGE MEETS SOLUTION

The CA-RES3 Plenary Meetings provided participants with the opportunity to highlight various aspects of biomass mobilisation and sustainability and to discuss barriers. The aim was to create favourable conditions to facilitate biomass uptake along the whole value chain. Discussions included a diverse set of topics that are described in more detail below.

3.1 Highlights from the Discussions

Biomass Waste Mobilisation and Circular Economy

Waste-to-energy encompasses various waste treatment processes – waste incineration, co-incineration of waste in power plants, cement and lime production, anaerobic digestion of biodegradable waste, pyrolysis and gasification – that generate energy in the form of electricity, heat and waste-derived fuel. Waste-to-energy can play a role in the circular economy by extracting the energy embedded in non-recyclable waste and by creating synergies with the EU Energy Union and the EU climate policy.

During the session on biomass waste mobilisation and the circular economy, the EC communication on waste-to-energy and the circular economy was discussed. This communication aims to ensure that the recovery of energy from waste in the EU supports the objectives of the circular economy action plan and is firmly guided by the EU waste hierarchy. Therefore, investments in new waste treatment capacities need to be consistent with the EU waste hierarchy and circular economy principles. Public support for waste-to-energy needs to be aligned with the waste hierarchy to avoid creating overcapacity for non-recyclable waste treatment such as incinerators.

The EC communication clarified the position of the different waste-to-energy processes in the waste hierarchy, which depends on the level of recycling (e.g. digestate recycled as a fertiliser) and the level of energy recovery (e.g. waste incineration with CHP) or waste reprocessing into materials used as fuels. However, Member States have some flexibility in applying the waste hierarchy (e.g. in some specific and justified cases, disposal or energy recovery may be preferable to recycling).

There is a potential to increase the energy efficiency of waste-to-energy processes. However, increased waste prevention and waste separation might reduce the share of waste-to-energy in favour of recycling. Initiatives and measures taken or envisaged to implement the principles of circular economy and fostering biomass waste mobilisation were discussed. However, for wet biomass, CT4 participants concluded that circular economy and waste management policies could be combined and would lead to a significant increase in biogas production.

As an example, in case of good waste separation, biogas production used as pre-treatment for composting is a good option. Participants highlighted the need to support and develop the flexibility of existing and future biogas installations, enabling them to provide several energy commodities (electricity, heat, biomethane) on demand, increasing the competitiveness of these bioenergy systems and contributing to grid balancing issues (electricity and gas) or transport issues.

Bioenergy Policies in the Various Member States

Bioenergy contributes to a wide range of policy objectives in the Member States including, among others, RES 2020 targets, a more flexible power system (grid balancing and storage), security of supply, competitiveness among local industry, social cohesion (jobs and development in rural areas), reduced greenhouse gas emissions and the creation of a bioeconomy.

At the same time, there are several risks/issues related to bioenergy such as impacts on air quality and other environmental issues (water and soil, etc.), biogenic GHG emissions (change in carbon stocks), competition between different uses of biomass, the need to ensure an efficient use of biomass, and low energy prices, although their importance varies widely across Member States.

To be competitive, bioenergy systems require favourable and facilitative environments and conditions along all value chains. In several MS, bioenergy policies have recently been adapted due to technology developments, changing market conditions, sustainability considerations, and competition issues between different uses of biomass feedstock. The sessions on bioenergy policies in the various Member States focused on policies to be implemented in the Member States due to an expected increased use of solid biomass and biogas. The reasons for this expected increase of domestic solid biomass use for energy are manifold. Some countries focus on policy targets, both 2020 targets under the RES directive and climate policy targets. For other countries, better use of available (waste) material, an increasing focus on local (woody) resources, the improved use of agricultural residues and the reduction in forest fires are of relevance.

In the discussions, Member States identified the current and most promising market segments (for the connection between local biomass and energy demand). For most MS, the first market segment mentioned is the heating sector. In particular, small-scale heating networks or domestic heating are identified as promising. District heating and CHP are also mentioned in several MS while electricity production in dedicated large power plants seems to be considered by only a few MS. Member States also presented policy developments for the use of sustainable solid biomass for heat and electricity. Participants discussed the environmental and social acceptance of biomass in residential/commercial markets and the challenges surrounding the increased import and export flows of solid biomass inside Europe to meet the 2020 RES targets. For large-scale application, concerns about the sustainable production/use of biomass appear to be the main bottleneck, even in countries with an established tradition of biomass use. Participants discussed whether sustainability schemes could help Member States overcome this problem and build an internal European market for solid biomass trade and help verify the sustainability of biomass produced outside the EU. For the small-scale (residential) heating sector, air quality issues will probably reduce the use of biomass in several Member States.

"Economic Sustainability" of Existing Bioenergy Installations

Member States have a stake in a new and diversified bioenergy system. Different renewable energy policies in Member States have contributed to significant investments in new and diversified bioenergy systems. Most systems have received subsidies (investment or production aid) ensuring a sufficient profitability, at least during first production years. Installations which receive subsidies (investment and production aid) must therefore ensure they are sufficiently profitable. Unlike CAPEX-driven

technologies such as wind and solar energy, OPEX-driven technologies are more sensitive to market price, policy and environmental developments. In addition, energy production is not guaranteed until the end of their technical and economic lifetime.

Participating countries discussed mitigation opportunities due to the risk of existing bioenergy installations being dismantled unexpectedly or prematurely, especially for the period beyond 2020. During the discussions, some participants recommended relying on the use of local biomass or bio-waste streams to reduce the risk on biomass feedstock prices. For countries with high industrial heat demand met through woody domestic biomass, the risks seem to be less critical. Some participants explained that for their countries, the use of biomass for electricity production has to be considered a transient option (sustainability concerns about the carbon neutrality of biomass) and therefore the long-term profitability of such power plants and the risk of shutdown are less critical. Some participants explained that the risk of heat demand for CHP installations must be taken into account when promoting biomass CHP or heat pathways instead of electricity production.

Some participants also concluded that the contribution of (large-scale) biomass-fired power plants to adequacy or flexibility issues on the electricity market is underutilised. Bioenergy's role in balancing the electricity market and providing storage options needs to be assessed in more detail.

Flexibility Potential of Bioenergy on the Markets

Participants took a close look at the role of bioenergy in balancing the electricity grid and providing storage options. Bioenergy can help balance the electricity grid and a wide range of technical options exist to implement balancing actions. However, most current biomass power plants have not been designed with grid balancing in mind, yet they can be optimised to incorporate more balancing aspects. However, as the IEA Bioenergy Technology Cooperation Programme (TCP) special project "Bioenergy´s Role in Balancing the Electricity Grid and Providing Storage Options – An EU Perspective" prepared by the International Energy Agency[1] demonstrated, currently bioenergy does not play a significant role as an effective management and storage option.

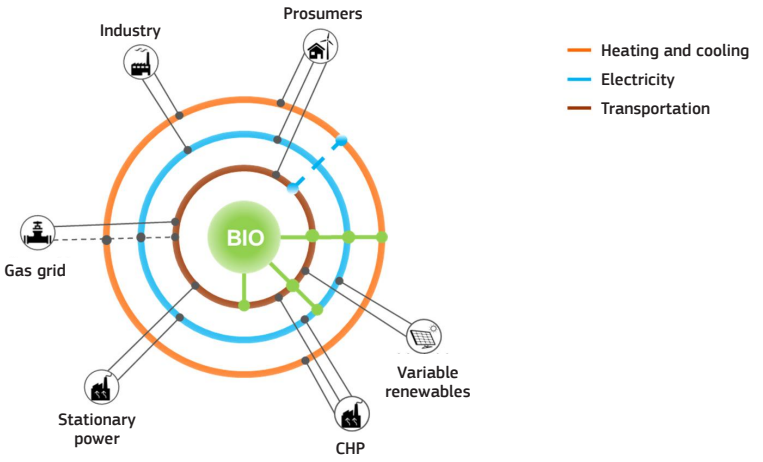
The situation surrounding Member States was compared in terms of share of bioelectricity and variable renewable electricity and grid connections. This comparison provides useful information on regional differences and the corresponding need for balancing. The potential and technologies for balancing the electricity grid vary significantly between regions due to differences in the use and availability of biomass, existing infrastructure and the degree of grid interconnectivity among other factors.

The cost of different renewable power generation technologies and storage technologies was also compared. This comparison shows opportunities for some bioenergy technologies in short term balancing (biogas used in gas engines, bioliquids) or seasonal balancing (solid biomass power plants or district heating and industrial CHP). Advanced options based on hydrogen production were also presented. The future role of bioenergy is seen to develop more towards short-term balancing to meet future market needs. Three potential technology development pathways have been identified in order

1 International Energy Agency (2017). "Bioenergy´s role in balancing the electricity grid and providing storage options – An EU Perspective" IEA bioenergy TCP special project. https://www.ieabioenergy.com/publications/bioenergys-role-in-balancing-the-electricity-grid-and-providing-storage-options-an-eu-perspective/

to strengthen the role bioenergy can play in a low carbon energy system: (1) increasing the flexibility of individual biomass installations and promoting the smart integration of energy carrier distribution grids; (2) developing more advanced biomass-based energy carriers that are more suitable for a electricity generation fleet capable of balancing operations; and (3) developing next generation concepts including biogenic CO_2 utilisation and the smart integration of renewable hydrogen.

FIGURE 4 Bioenergy's Role in Balancing the Electricity Grid and Providing Storage Options



Arasto, A., et al. 2017: Bioenergy's Role in Balancing the Electricity Grid and Providing Storage Options – An EU Perspective. IEA Bioenergy. IEA Bioenergy: Task 41 P6: 2017:01. https://www.ieabioenergy.com/wp-content/uploads/2017/02/IEA-Bioenergy-Bioenergy-in-balancing-the-grid_master_FINAL-Revised-16.02.17.pdf

Use of Biomethane

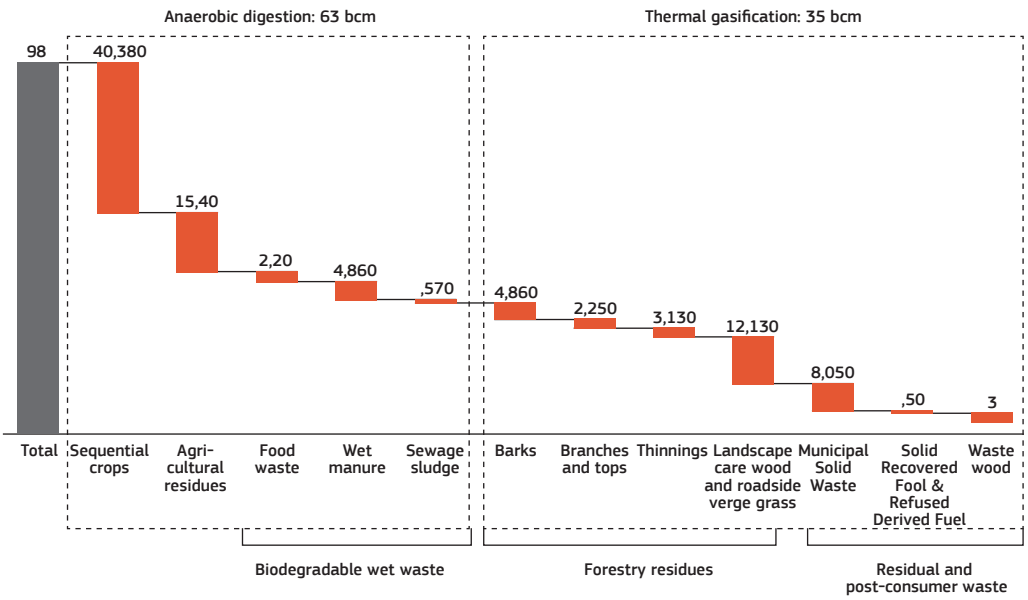
Biogas is a renewable gas produced by the anaerobic digestion of organic matter. The biomethane produced after purification of the biogas achieves the same quality as natural gas. Biomethane can be used in an efficient and versatile manner for transportation, heat and electricity production. It can also be cost-efficiently transported, stored and distributed through existing gas infrastructure.

Several Member States have supported biogas in the last decade and are turning their attention to the development of biomethane to support their RES target achievement and in response to the need to decarbonise the gas sector, among others. There is a variety of incentives for biomethane in some Member States in the different sectors (electricity, heat and transport), ranging from market premiums to quotas, investment grants, tax exemptions and obligations on fuel suppliers. While several Member States have started encouraging the use of biomethane in transport, more consideration still needs to be given to various questions as to the design of such support scheme with more specific priorities to be set. This includes, for example, an assessment as to which sector biomethane is best used in to achieve the highest possible GHG savings, taking the particular situation in each Member State into consideration.

Biomethane is becoming more important on the policy agenda in various Member States. The conversion of biogas into biomethane for grid injection or direct use in transport is currently seen as a promising option in several Member States. Even though biomethane is still injected into the national grid at low levels, an increase is foreseen in numerous Member States.

During a joint session organised with Core Theme 5, Navigant presented the results of the study issued in 2018 financed under the Gas for Climate initiative[2]. According to this study, it is possible to scale up production of biomethane in the EU to 1,000 TWh by 2050 (25% of current natural gas consumption). Two main conversion technologies were considered (anaerobic digestion and thermal gasification) as well as a large variety of feedstocks as shown in the figure below.

FIGURE 5 Biomethane Potential per Conversion Technology and Feedstock Type by 2050



Van der Leun, K., 2018: The Role of Renewable Gas in a Decarbonised EU Energy System. 31st Meeting of the European Gas Regulatory Forum. Navigant/Ecofys. 16 October 2018. https://ec.europa.eu/energy/sites/ener/files/documents/01.c.01_mf31_presentation_ecofys_potential_resg_leun.pdf

Some Member States have implemented feed-in-tariffs (FiT) or feed-in-premiums for biomethane injected into natural gas networks. FiT may be dependent on the capacity of the injection plant and in some cases, they are designed to foster the use of waste. Feed-in premiums may be partially indexed to natural gas prices or consumer price indexes. In some cases, the support scheme is complemented by grid connection costs being partially supported by the grid operator. Adaptations to support schemes are ongoing in several Member States either for injection into natural gas grids or for use in the transport sector or in high efficiency CHP plants. Still, significant cost reductions in biomethane production will be necessary to foster the development of biomethane at affordable public costs between now and 2030.

2 www.gasforclimate2050.eu

The new renewable energy directive 2018/2001 requires biogas and biomethane to fulfil sustainability and GHG emissions saving criteria. Sustainability compliance will be verified through national certification schemes or voluntary schemes recognised by the European Commission. In this context, the mass balance system used by economic operators and rules to avoid double counting are extended to biomethane in gas grids. Fulfilling the sustainability and GHG emissions saving criteria requires a careful plant design and sound management along the supply chain, particularly in terms of methane emissions.

CT4 participants discussed both the advantages and disadvantages of biomethane with a view to discovering best practices and the most efficient options regarding GHG savings. Member States presented their different experiences and participants learned from examples from Member States, which are prioritising biogas upgrading to biomethane and injection into the natural gas network.

As a good practice example, the support for the uptake of advanced biofuels in the transport sector in Italy was presented: in early 2018 the Italian Government issued the Decree of the Ministry of Economic Development of 2 March 2018, introducing a support scheme for biomethane and advanced biomethane injected into the natural gas grid and for advanced biofuels (different from biomethane) to be used in the transport sector. This new scheme has an important role to play in achieving the sub-target for advanced biofuels for the period 2018–2022, starting at 0.6% in 2018 and increasing to 1.85% in 2022. The decree specifies that the subtarget for advanced biofuels must be fulfilled 75% by biomethane and 25% by other advanced biofuels (respective shares reviewed every two years). The decree provides measures for the following four categories of advanced biofuels:

1. Biomethane injected into the natural gas grid without a specific intended use;
2. Biomethane injected into the natural gas grid to be used in the transport sector;
3. Advanced biomethane injected into the natural gas grid to be used in the transport sector; and
4. Advanced biofuels different from biomethane to be used in the transport sector.

Biomethane and biofuels must comply with sustainability criteria. Support from the scheme concerning advanced biomethane and advanced biofuel is limited to a maximum of ten years.

Only biomethane injected into natural gas grids can access the support mechanism, with the definition of natural gas grids encompassing all networks, transport and distribution systems, including transport systems using cylinder trucks and natural gas distributors for transport, even if they are not connected to the gas transmission and distribution networks.

For biomethane and advanced biomethane to be used in the transport sector, Consumption Release Certificates (“Certificati di Immissione in Consumo di biocarburanti”, CICs) are issued to the biomethane producer and can be sold to transport fuel retailers subject to the biofuels supply obligation. Producers of advanced biomethane injected into the natural gas grid to be used in the transport sector can obtain one CIC for every 5 GCal of biomethane supplied into the market at a fixed value of EUR 375/CIC. Producers’ revenues consist of payment for the sale of biomethane and the sale of CICs. Consumers do not bear the cost of the incentives under the decree, as the scheme is fully financed by transport fuel retailers. The fuel retailers who participate in the mechanism commit to buy the CICs in the amount necessary to fulfil their yearly supply obligation.

National biomethane registers have been created in several European countries (Austria, Denmark, Estonia, Finland, France, Germany, The Netherlands, Switzerland and UK). Their main purpose is creating renewable gas certificates specifying the installation, quantity and quality of renewable gases injected into the national gas grids.

One example is the Austrian Biomethane Register (AGCS).[3] AGCS Gas Clearing and Settlement AG, in its role as balance group coordinator for the Austrian gas market, has been operating the Biomethane Registry Austria since 2012, as required by the Austrian Renewable Electricity Act. The register is responsible for creating biomethane certificates for the national Renewable Power Settlement Agency (OeMAG, Abwicklungsstelle für Ökostrom), which manages the national subsidy scheme for renewable electricity in Austria. The Austrian Biomethane Register cooperates with the Austrian Environmental Agency ("Umweltbundesamt" – UBA), which operates the national registry for sustainable biofuels as well as with the German biomethane registry operated by dena, the German national energy agency. The cooperation with the Austrian Environmental Agency is specifically aimed at preventing double-counting and the double-sale of biomethane through the use of a common interface.

Cooperation between all existing biomethane registries is currently being conducted in the framework of the European Renewable Gas Registry (ERGaR). The purpose of ERGaR is to enable the cross-border trade of biomethane among the participating national registries. ERGaR also aims at providing for the cross-border transfer of sustainability characteristics attached to the consignments and enables producers in countries without a registry to trade renewable gas across Europe.

3.2 Good Practices

Biomass Exchange Platform

The development of biomass exchange platforms contributes to more efficient local biomass markets and biomass trade within the European Union and its Member States. Participants were provided with a best practice example related to the establishment of a biomass exchange platform. The Biomass Exchange Platform BALTPOOL (hereafter, BALTPOOL)[4] is a market-based instrument promoting the use of biomass in heat production launched in 2012 in Lithuania. Today, BALTPOOL operates in Lithuania, Latvia, Estonia, Poland and, via partners, in Denmark and Finland. The Biomass Exchange has significantly changed the market situation and resulted in a more competitive biomass market. It not only standardised biomass products and biomass supply procedures, but also established equal and transparent trading rules for all participants. Furthermore, it lowered market barriers for new market participants, instituted a risk management system and created an effective price establishment mechanism to open auction. This contributed to the disappearance of price differences between neighbouring municipalities and the solution of the concentration problem on the biomass supply side.

3 https://www.biomethanregister.at/de
4 https://www.baltpool.eu/en/

The Exchange provides additional advantages by introducing standardised biomass products (e.g. 4 products specifications for wood chips), four contract durations (from weekly to half-yearly) and biomass supply procedures. The Biomass Exchange provides participants with a faster and cheaper biomass purchase procedure, standardised biomass products and delivery rules, by bundling all available market information in one place.

Bioenergy for Business (Horizon 2020 project)

Many countries have developed strategies and instruments in order to stimulate the availability of domestic biomass feedstocks and the use of these resources for bioenergy purposes. However, achieving a good match between domestic bioenergy policies and markets is still challenging. In the framework of the "Methods to Improve Mobilisation of Domestic Biomass" session at the second CA-RES3 Plenary Meeting, a representative from the H2020 Bioenergy4Business project, which looked at business opportunities for heating with local available bioenergy sources, presented selected case studies defining the most promising market segments for a fuel switch from fossil fuels to bioenergy. The goal of this H2020 project was to support and promote the (partial) substitution of fossil fuels (coal, oil, gas) used for heating with available bioenergy sources (industrial wastes, forest biomass, straw and other agricultural biomass) in the partner countries and beyond. The project's results included information about market potentials, capacity building/training, decision-support tools and communication activities targeted at relevant stakeholders, tools to support the assessment, planning and implementation of such projects, and the dissemination of "best-practice" business models.

The examples presented illustrated the fact that municipalities located in areas near the forest and far away from gas infrastructure and other energy sources hold potential for a fuel switch to solid biomass. The challenge is to find locations where the local biomass is cheaper than local fossil fuel prices. Agricultural residues can also be a potential market. In this context, several measures for improvement were identified, among others:

- Adoption of requirements on the efficiency of domestic heating appliances (installations) operating with biomass, with a view to reducing the total volume of forest felling to meet energy requirements
- Drawing up of regulation governing the registration and certification of qualified installers of biomass-fired boilers and heaters
- Specific support to private physical persons for the construction of installations utilising biomass for household needs in buildings
- Setting up of the sustainability criteria in conformity with the RES Directive on production and consumption of biofuels and liquid fuels from biomass.

Cascading Use of Solid Biomass

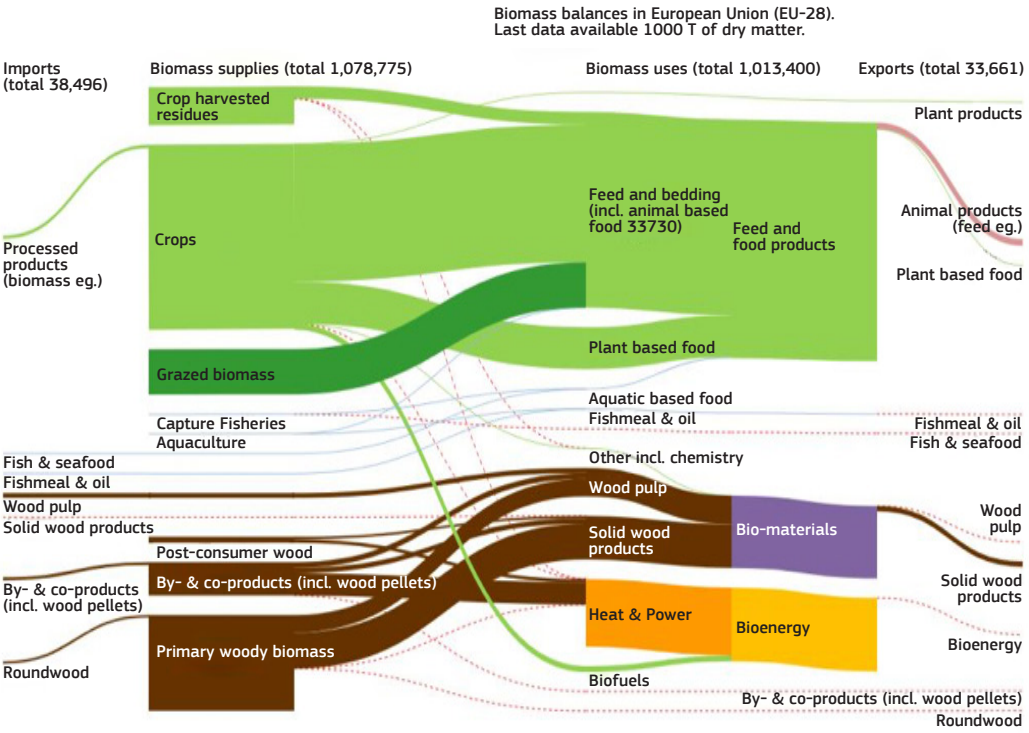
The sustainable sourcing of biomass is a requirement for bioenergy to be accepted currently. The concerns related to this issue go far beyond the cultivation and collection of biomass and also touch upon the impact of bioenergy on the material use of biomass. As a result of these concerns, many countries are discussing the pros and cons of cascading while remembering sustainability considerations. Many participating Member States highlighted the difficulties surrounding this issue with a view to implementing the Renewable Energy Directive. The cascading use of biomass encompasses not only the energy sector, but also agriculture, industry and waste sectors. In addition, there is no common definition, since cascading depends on (environmental/economic) policy goals, local conditions, project-based approaches and biomass feedstocks, among others. An overview of the framework used today to secure sustainability in various Member States was provided as a basis for the discussion. The European Commission presented a state-of-play of EU bioenergy sustainability policy and its initiative on a "guidance on cascading use".

In conclusion, participants discussed the status quo of the state-of-play regarding biomass cascading criteria in order to help improve criteria harmonisation and reporting requirements, both of which are vital for the sustainable mobilisation of bioenergy for the future. Participants concluded that market-driven cascading – based on price difference – is already effective, but that support mechanisms must be adapted to avoid distortion on the biomass feedstock markets.

Task Force

The Renewable Energy Directive requires the availability of harmonised data relevant for monitoring the development of objectives concerning a bio-based economy. The Member States are obliged to report on their progress towards the EU's 2020 renewable energy goals in their biannual Renewable Energy Progress Reports. Member States are supported in providing harmonised data and calculations of the renewable energy shares by the SHARES tool (Short Assessment of Renewable Energy Sources) developed by EUROSTAT. However, for the biennial reports, much more data is needed as it is insufficiently defined and very difficult to collect at a reasonable cost. In this context, there is a strong need for more data transparency and harmonisation across the EU, which could be done through the exchange of good practices between MS, a global balance or the use of non-energy databases or statistics (see figure below). Ambiguities with respect to indicators, conversion factors and data sources need to be resolved to enhance the harmonisation of biomass reporting in a statistically reliable way.

FIGURE 6 Biomass Flow Diagram for the EU-28



Gurría, P., et al., 2017. Biomass Flows in the European Union The Sankey Biomass Diagram – Towards a Cross-set Integration of Biomass. JRC Technical Reports. EUR 28565 EN. https://publications.jrc.ec.europa.eu/repository/bitstream/JRC106502/kjna28565enn.pdf

Based on the RED biomass reporting experiences of EU Member States, six participating countries within the Task Force of Biomass Reporting aimed to provide recommendations to the European Commission and EUROSTAT for future reporting (Recast Renewable Energy Directive, Governance Regulation) on sustainable biomass as a feedstock for energy towards a bio-based economy and the impact of bioenergy on the bio-based economy. In addition, proposals/recommendations were made for future reporting on sustainable biomass in the RES-Directive and the Governance Regulation. Indicators, conversion factors, data sources and the harmonisation of biomass reporting in a statistically reliable way were discussed in more detail to make the reporting process more compliant and efficient. The final report will be used by EUROSTAT and the JRC for further data collection related to governance regulation and monitoring of the bio-economy.

4 MAIN FINDINGS AND ACHIEVEMENTS

CA-RES3 Core Theme 4 focused on bioenergy topics requiring a better exchange of information and experience between participating countries to help increase the use and production of sustainable bioenergy sources and their trade, while increasing efficiency. Countries are at different stages in their bioenergy development and experience vastly different situations (e.g. exporting countries vs importing countries). Therefore, they have been able to learn from each other about bioenergy policies to increase mobilisation, production and use, and about the implementation of sustainability and GHG emissions reduction criteria. The input presentations from several Core Theme 4 participants provided a sound basis for discussion among participating countries, thus laying the ground for a joint learning process. The discussion in the Core Theme 4 meetings helped participants gain understanding of different policy options, EU policy developments as well as the good practices from the different participating countries. The Core Theme allowed participants to deepen their understanding of the requirements of the RES directive and pathways for its implementation.

One of the challenges posed by the new renewable energy directive is the introduction of sustainability and greenhouse gas emissions reduction criteria for biomass fuels used in the electricity sector and in the heating and cooling sector, in order to ensure high greenhouse gas emissions savings, avoid sustainability impacts, and promote the internal market. These criteria (land criteria and end-use criteria) enhance resource efficiency and are required for biomass to be compliant with RES obligations and be eligible for financial support. The CA-RES has proven a highly valuable platform to help participating countries gain insights into the directive's requirements in the area of sustainability and GHG emissions reduction criteria, and prepare for their implementation and verification.

Member States are responsible for implementing the new sustainability criteria and their verification and are currently faced with several choices in terms of verifying compliance. Economic operators must demonstrate sustainability compliance by providing the relevant national authority with data/evidence under a national system or by using voluntary (market-based) schemes recognised by the European Commission. There are several issues to be incorporated into the voluntary schemes such as the fact that forestry supply chains differ from the agricultural supply chains and a regional approach is already widely use in forest certification. Further, there is more flexibility in criteria between Member States due to the possibility of adding sustainability requirements for biomass fuels. Member State presentations provided insight into experiences related to the development of a national sustainability scheme for biofuels based on the RES Directive 2009/28/EC and for biomass fuels based on their own sustainability criteria. They offer benefits but also involve new challenges in terms of extending the current scheme to cover biomass fuels as well. Case studies on the compliance of existing tools with the new GHG savings criteria are necessary.

CT4 participants also discussed the advantages and disadvantages of biomethane with a view to discovering best practices for biogas valorisation. Member States presented their different experiences and participants learned from examples from Member States, which are implementing support schemes for biomethane production and injection into the natural gas network. While several Member States have started encouraging the use of biomethane in transport, more consideration still needs to be given to various questions as to the design of such support scheme with more specific priorities due to be set. This includes, for example, an assessment as to which sector biomethane is best used in to achieve the

highest possible GHG savings, taking the particular situation in each Member State into consideration. However, Member States would need to make a choice about which sectors biomethane should be used in for the greatest benefits. If used for dispatchable power and industrial applications, this would potentially provide more significant cost reductions to energy systems in the medium- to long-term than biomethane being used in the transport sector (where use in long-distance trucks or container shipping might be promising options, however).

Participants also discussed methods to improve mobilisation of domestic biomass. Many countries have developed strategies and instruments to stimulate the availability of domestic biomass feedstocks and the use of these resources for bioenergy purposes. However, a good matching between domestic bioenergy policies and markets is still challenging. The discussions showed that promising market segments for biomass heating are mainly driven by local biomass suppliers and need adapted financial instruments to expand given that investors primarily face CAPEX barriers, rather than OPEX barriers. For biogas, a vivid discussion showed local solutions are manifold depending on a variety of policy and physical factors.

Furthermore, during another parallel session, the EC communication on waste-to-energy and the circular economy was used as a starting point for discussions on the topic of biomass waste mobilisation and circular economy. There appears to be potential to increase the energy efficiency of waste-to-energy processes. However, in the long run, increased waste prevention and waste separation may reduce the share of waste-to-energy in favour of recycling. Initiatives and measures taken or envisaged to implement the principles of circular economy and fostering biomass waste mobilisation were discussed. CT4 participants concluded that circular economy and waste management policies will lead to a significant increase in biogas potential.

Discussions were also held on mitigation opportunities for the potential risk of unexpected or untimely dismantling of existing bioenergy installations, especially for the period beyond 2020, recognising that this risk varies in importance across participating countries. During the discussions, some participants recommended relying on the use of local biomass or bio-waste streams to reduce the risk on biomass feedstock prices. Participants concluded that the potential shutdown of bioenergy systems is highly country-specific and that multiple risk factors, including market prices, sustainability criteria and heat demand for CHP, play a role.

CT4 participants explored the concept of biomass exchange platforms and whether their development could lead to more efficient local biomass markets and biomass trade inside the EU and thus consequently help Member States to reach their renewable energy targets. Biomass exchange platforms can improve local bioenergy markets by reducing bioenergy prices, fostering the emergence of new market players and the introduction of product standards. Platforms improve the transparency of the market, reduce fragmentation and can also integrate sustainability criteria, facilitating the purchase of sustainable biomass by market participants. In conclusion, participants discussed the potential of replicating existing biomass exchange platforms in other Member States and the possibility of making use of such platforms not only for domestic trade, but also for biomass trade across Member States.

Participants also carefully considered the role of bioenergy in balancing the electricity grid and providing storage options. During the session, the level of flexibility currently provided by bioenergy systems in MS was discussed and compared to identify regional differences and existing barriers. Participants concluded that for most Member States, flexibility is not an issue that is given much consideration today, but that it will gain more importance after 2020.

5 ABBREVIATIONS

Abbreviation	Full Name
BALTPOOL	Baltpool is a biomass exchange, operating in Lithuania, Latvia, Estonia, Poland and via partners – in Denmark and Finland
BAT	Best Available Technology
BAT-AEELs	BAT-associated energy efficiency levels
CAP	Common Agricultural Policy
CAPEX	Capital Expenditures
CA-RES	Concerted Action on the Renewable Energy Sources Directive
CHP	Combined Heat and Power
CICs	Consumption Release Certificates
CO_2	Carbon Dioxide
CT4	Core Theme 4
EC	European Commission
ERGaR	European Renewable Gas Registry
ETS	Emission Trading System
EU	European Union
EUROSTAT	European Statistical Office, European Commission Directorate-General
FiT	Feed in Tariff
GCal	Gigacalories
GHG	Greenhouse Gas
GO	Guarantees of Origin
IEA	International Energy Agency
JRC	Joint Research Centre, European Commission
LULUCF	Land Use, Land Use Change and Forestry
MS	Member State(s)
OPEX	Operational Expenditures
RED	Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC
RED II	Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources
REDIIBIO	Technical assistance project to the European Commission on the harmonised and correct implementation of the new EU sustainability criteria for forest and agricultural biomass used for energy generation, as set out in article 29 of the RED II.
RES	Renewable Energy Sources
SHARES	Short Assessment of Renewable Energy Sources
TCP	Technology Collaboration Programme of the International Energy Agency
UBA	Austrian Environmental Agency ("Umweltbundesamt")

This is a public CA-RES3 report

For more information please send an email to:
Leonardo.Barreto-Gomez@energyagency.at,
Shruti.Athavale@energyagency.at,
Anna.Kassai@energyagency.at

The first phase of the Concerted Action to support the implementation of the RES Directive 2009/28/EC (CA-RES) was launched with the participation of the responsible authorities from 30 EU countries and supported by Intelligent Energy Europe (IEE) in July 2010 to provide a structured and confidential dialogue on how to address the cost-effective implementation of the RES Directive 2009/28/EC.
This publication captures the highlights of the third phase of the Concerted Action, which started in November 2016, and is supported by Horizon 2020 (H2020) funding programme. The CA-RES is coordinated by the Austrian Energy Agency (AEA).

For further information please visit **www.ca-res.eu**