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2016/0381 (COD)

Subject:	Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources (recast)

The Annex contains the consolidated compromise text of the above draft Directive, subject to revisions by the legal linguists of both Institutions.

PE-CONS No/YY - 2016/0382 (COD)

DIRECTIVE
OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of

on the promotion of the use of energy from renewable sources

(recast)

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 194(2) thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee,

Having regard to the opinion of the Committee of the Regions,

Acting in accordance with the ordinary legislative procedure,

Whereas:

(1) Directive 2009/28/EC of the European Parliament and of the Council[1] has been substantially amended several times[2]. Since further amendments are to be made, that Directive should be recast in the interests of clarity.

(2) Promoting renewable forms of energy is one of the goals of the Union energy policy***, in accordance with Article 194(1) of the Treaty on the Functioning of the European Union (TFEU), that is pursued by this Directive***. The increased use of energy from renewable sources ▌ constitutes an important part of the package of measures needed to reduce greenhouse gas emissions and comply with the ***Union's commitment under the*** 2015 Paris Agreement on Climate Change***, following the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 21) (the 'Paris Agreement')***, and the Union 2030 energy and climate framework, including the binding target to cut emissions in the Union by at least 40 % below 1990 levels by ▌ ***2030. The Union's binding renewable energy target for 2030, Member States contributions to the latter target, including their baseline scenarios resuming their national overall targets for 2020, are among the elements which have an overarching importance for the Union's energy and environmental policy. Other such elements of overarching importance are for instance contained in this Directive's framework for developing renewable heating and cooling and for the development of renewable transport fuels.***

[1] 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 (OJ L 140, 5.6.2009, p. 16).

[2] See Annex XI, Part A.

(3) ***The increased use of energy from renewable sources also has a fundamental*** part to play in promoting the security of energy supply, ***sustainable energy at affordable prices,*** technological development and innovation ***as well as technological and industrial leadership while*** providing ***environmental, social and health benefits as well as major*** opportunities for employment and regional development, especially in rural and isolated areas ▌***, in*** regions with low population density ***and in territories undergoing partial deindustrialisation***.

(4) In particular, ***reducing energy consumption,*** increasing technological improvements, incentives for the use and expansion of public transport, the use of energy efficiency technologies and the promotion of the use of energy from renewable sources in the electricity, heating and cooling sectors as well as in the transport sector are very effective tools , together with energy efficiency measures ▌ for reducing greenhouse gas emissions in the Union and the Union's ***energy*** dependence ▌ .

(5) Directive 2009/28/EC established a regulatory framework for the promotion of the use of energy from renewable sources which set binding national targets on the share of renewable energy sources in energy consumption and transport to be met by 2020. Commission Communication of 22 January 2014[1] established a framework for future Union energy and climate policies and promoted a common understanding of how to develop those policies after 2020. The Commission proposed that the Union 2030 target for the share of renewable energy consumed in the Union should be at least 27 % ▌***, which was endorsed by the*** European Council of October ***2014,*** indicating that Member States may set their own more ambitious national targets***, in order to deliver on their planned contributions to the Union 2030 target and go beyond them***.

[1] "A policy framework for climate and energy in the period from 2020 to 2030" (COM/2014/015 final).

(6) ***The European Parliament, in its resolution of 5 February 2014 on "A 2030 framework for climate and energy policies", and in its resolution of 23 June 2016 on "The renewable energy progress report", went further, stressing that, in light of the Paris Agreement and the recent renewable technology costs reductions, it was desirable to be significantly more ambitious.***

(***7)*** ***The ambition set out in the Paris Agreement and technological developments, including cost reductions for investments in renewable energy, should therefore be taken into account.***

(8) It is thus appropriate to establish a Union binding target of at least ***32*** % share of renewable energy ***and the Commission should assess whether this target should be reviewed upwards in light of substantial costs reductions in renewable energy production, the Union's international commitments for decarbonisation or significant decrease in energy consumption in the Union***. Member States should define their contribution to the achievement of this target as part of their Integrated National Energy and Climate Plans through the governance process set out in Regulation [Governance].

(9) The establishment of a Union binding renewable energy target for 2030 would continue to encourage the development of technologies which generate renewable energy and provide certainty for investors. A target defined at the Union level would leave greater flexibility for Member States to meet their greenhouse gas reduction targets in the most cost-effective manner in accordance with their specific circumstances, energy mixes and capacities to produce renewable energy.

(10) ***In order to ensure the consolidation of the results achieved under Directive 2009/28/EC, the*** national targets set for 2020 should constitute Member States' minimum contribution to the new 2030 framework. Under no circumstances the national share of renewables should fall below such contribution and ▌ in ***that*** case ▌, the relevant Member States should take the appropriate measures to ensure that this baseline is maintained as ***set out*** in Regulation [Governance]. ***If a Member State does not maintain its baseline share as measured over a one-year period, it should, within one year, take additional measures to cover this gap to its baseline scenario. Where a Member State has effectively taken such necessary measures and fulfilled its obligation to cover the gap, it should be deemed to comply with the mandatory requirements of its base-line scenario as from the moment in time when the gap in question occurred and both under this Directive and under Regulation [Governance]. The Member State in question therefore cannot be considered to have failed to fulfil its obligation to maintain its baseline share for the period in time where the gap occurred. Both the 2020 and 2030 frameworks serve the environmental and energy policy objectives of the Union.***

(11) Member States should take additional measures in the event that the share of renewables at the Union level does not meet the Union trajectory towards the at least ***32*** % renewable energy target. As set out in Regulation [Governance], if an ambition gap is identified by the Commission during the assessment of the Integrated National Energy and Climate Plans, the Commission may take measures at Union level in order to ensure the achievement of the target. If a delivery gap is identified by the Commission during the assessment of the Integrated National Energy and Climate Progress Reports, Member States should apply the measures set out in Regulation [Governance], which are giving them enough flexibility to choose.

(12) In order to support Member States' ambitious contributions to the Union target, a financial framework aiming to facilitate investments in renewable energy projects in those Member States should be established, also through the use of financial instruments.

(13) The Commission should focus the allocation of funds on the reduction of the cost of capital of renewables projects, which has a material impact on the cost of renewable energy projects and on their competitiveness***, as well as to the development of essential infrastructure for an enhanced technically and economically affordable uptake of renewable energy such as transmission and distribution grid infrastructure, intelligent networks and interconnections***.

(14) The Commission should facilitate the exchange of best practices between the competent national or regional authorities or bodies, for instance through regular meetings to find a common approach to promote a higher uptake of cost-efficient renewable energy projects, encourage investments in new, flexible and clean technologies, and set out an adequate strategy to manage the retirement of technologies which do not contribute to the reduction of emissions or deliver sufficient flexibility, based on transparent criteria and reliable market price signals.

(15) Directive 2001/77/EC of the European Parliament and of the Council ▌ and, Directive 2003/30/EC of the European Parliament and of the Council▌, and Regulation (EC) 1099/2008 of the European Parliament and of the Council ▌established definitions for different types of energy from renewable sources. ▌***Union energy internal market rules establish*** definitions for the electricity sector in general. In the interests of legal certainty and clarity it is appropriate to use those definitions in this Directive.

(16) Support schemes for electricity generated from renewable sources have proved to be an effective way of fostering deployment of renewable electricity. If and when Member States decide to implement support schemes, such support should be provided in a form that is as non-distortive as possible for the functioning of electricity markets. To this end, an increasing number of Member States allocate support in a form where support is granted in addition to market revenues ***and introduce market-based systems to determine the necessary level of support. Together with steps to make the market fit for rising shares of renewables this is a key element of increasing the market integration of renewables, while taking into account the different abilities of small and large producers to respond to market signals. Small-scale installations can be of great benefit to increase public acceptance and to ensure the rollout of renewable energy projects, in particular at local level. To ensure their participation, specific conditions including feed-in-tariffs, might therefore still be necessary to ensure a positive cost-benefit ratio. The definition of small-scale installations for the purpose of obtaining aid is important to provide legal certainty to investors. State aid rules contain such definitions. In addition, these conditions should be in line with the rules set out in applicable EU legislation on the electricity market.***

(17) Pursuant to Article 108 of the Treaty on the Functioning of the European Union, the Commission has the exclusive competence to assess the compatibility of State aid measures with the internal market, which the Member States may put in place for deployment of energy from renewable sources. This assessment is carried out on the basis of Article 107 (3) of the Treaty and in line with any relevant provisions and guidelines the Commission may adopt to this effect. The provisions of this Directive are without prejudice to that exclusive competence granted by the Treaty.

(18) Electricity generation from renewable sources should be deployed at the lowest possible cost for consumers and taxpayers. When designing support schemes and when allocating support, Member States should seek to minimise the overall system cost of deployment ***along the decarbonisation pathway towards the low-carbon economy objective for the year 2050. Market-based mechanisms, such as competitive bidding have proven to effectively reduce support cost in competitive markets in many circumstances. However, in specific circumstances, competitive bidding may not necessarily lead to efficient price discovery. For this reason balanced exemptions may need to be considered to ensure cost-effectiveness and minimise overall support cost. In particular, Member States should be allowed to grant exemptions from competitive bidding and direct marketing for small scale installations and demonstration projects in order to take into account their more limited capabilities. Since the Commission assesses the compatibility of support to renewables with the internal market on a case-by-case basis, these exemptions should comply with the relevant thresholds set out in the Guidelines on State aid for environmental protection and energy. In the Guidelines for 2014-2020 these thresholds are set at 1 MW (and 6 MW or 6 generation units for wind energy) and 500 kW (and 3 MW or 3 generation units for wind energy) in terms of exemptions respectively to competitive bidding and to direct marketing. To increase the effectiveness of competitive bidding processes to minimize overall support costs, competitive bidding processes should in principle be open to all generators producing electricity from renewable sources on a non-discriminatory basis. While Member States develop their support schemes they may limit bidding processes to specific technologies where this is needed to avoid sub-optimal results in terms of network constraints, grid stability, system integration costs, the need to diversify the*** energy mix, and the long term potential of technologies.

(19) ***In its conclusions of 24 October 2014 on "2030 Climate and Energy Policy Framework", the European Council stressed the importance of a more interconnected internal energy market and the need of sufficient support to integrate ever increasing levels of variable renewable energy and thus allow the Union to fulfil its leadership ambitions for the energy transition. It is therefore important urgently to increase the level of interconnection and make progress towards the European Council's agreed objectives, in order to maximise the Energy Union's full potential.***

(20) ***When developing support schemes for renewable sources of energy, Member States shall consider the available sustainable supply of biomass and take due account of the principles of the Circular Economy and of the waste hierarchy established in Directive 2008/98/EC of the European Parliament and of the Council in order to avoid unnecessary distortions of raw material markets. Waste prevention and recycling of waste should be the priority option. Member States should avoid creating support schemes, which would be counter to targets on treatment of waste and would lead to inefficient use of recyclable waste.***

(21) ***Member States have different renewable energy potentials and operate different schemes of support for energy from renewable sources at the national level. The majority of Member States apply support schemes that grant benefits solely to energy from renewable sources that is produced on their territory. For the proper functioning of national support schemes it is vital that Member States continue to be able to control the effect and costs of their national support schemes according to their different potentials. One important means to achieve the aim of this Directive remains to guarantee the proper functioning of national support schemes, as under Directives 2001/77/EC and 2009/28/EC, in order to maintain investor confidence and allow Member States to design effective national measures for their respective contribution to the Union's 2030 target for renewable energy and for any national target they have set for themselves. This Directive should facilitate cross-border support of energy from renewable sources without affecting national support schemes in a disproportionate manner.***

(22) Member States should avoid distortive situations resulting in extensive import of resources from third countries. A life cycle approach should be considered and promoted in this respect.

(23) Member States should ensure that renewable energy communities, can participate in available support schemes on an equal footing with other large participants. To that end, Member States should be allowed to take measures, including provision of information, technical and financial support, reduce administrative requirements, include community-focused bidding criteria, create tailored bidding windows for renewable energy communities, or allow them to be remunerated through direct support when they comply with requirements of small installations.

(24) The planning of the infrastructure needed for electricity generation from renewable sources should take into account policies relating to the participation of those affected by the projects in particular local population.

(25) Consumers should be provided with comprehensive information, including information on the energy efficiency gains of heating and cooling systems and lower running costs of electric vehicles, to allow them to make individual consumer choices with regard to renewable energies and avoid technological lock-in.

(26) The opening of support schemes to cross-border participation limits negative impacts on the internal energy market and can, under certain conditions, help Member States achieve the Union target more cost-efficiently. Cross-border participation is also the natural corollary to the development of the Union renewables policy ***fostering convergence and cooperation to contribute to the*** Union-level binding target ▌. It is therefore appropriate to ***encourage*** Member States to ▌ open support to projects located in other Member States, and define several ways in which such progressive opening may be implemented, ensuring compliance with the provisions of the Treaty on the Functioning of the European Union, including Articles 30, 34 and 110. ***As electricity flows cannot be traced, it is appropriate to link the opening to shares representing an aspiration towards actual levels of physical interconnections and to allow Member States to restrict their open support schemes to Member States with whom they have a direct network connection as a practical proxy for demonstrating the existence of physical flows between the Member States. This should not however in any way affect cross-zonal and cross-border functioning of the electricity markets.***

(27) In order to ensure that the opening of support schemes is reciprocal and brings mutual benefits a cooperation agreement should be signed between participating Member States. Member States should retain control over the pace of deployment of renewable electricity capacity on their territory, in order in particular to take account of associated integration costs and required grid investments. Member States should thus be allowed to limit the participation of installations located on their territory to tenders opened to them by other Member States. The bilateral agreement should sufficiently reflect on all relevant points, such as, reflect on how the costs concerning the project which are built by a state on the territory of another state are accounted for, including the expenditures related to strengthening networks, transfers of energy, storage and back-up capacities, as well as possible congestions in the network. When doing so, Member States should however have taken due consideration of all measures that may allow for a cost-effective integration of such additional renewable electricity capacity, be they of regulatory nature (for instance related to market design) or additional investments in various sources of flexibility (for instance interconnections, storage, demand response, or flexible generation).

(28) Without prejudice to ***Articles 107 and 108 TFEU***, renewables support policies should be ***predictable,*** stable and avoid frequent ***or retroactive*** changes. ***Policy unpredictability and instability*** have a direct impact on capital financing costs, the costs of project development and therefore on the overall cost of deploying renewables in the Union. Member States should prevent the revision of any support granted to renewable energy projects from having a negative impact on their economic viability. In this context, Member States should promote cost-effective support policies and ensure their financial sustainability. ***" Moreover, a long-term schedule of indicative nature covering the main aspects of the expected support should be published, without affecting the ability of Member States to decide on budget allocation in the years covered by the schedule.***

(29) Member States' obligations to draft renewable energy action plans and progress reports and the Commission's obligation to report on Member States' progress are essential in order to increase transparency, provide clarity to investors and consumers and allow for effective monitoring. Regulation [Governance] integrates those obligations in the Energy Union governance system, where planning, reporting and monitoring obligations in the energy and climate fields are streamlined. The transparency platform on renewable energy is also integrated in the broader e-platform established in Regulation [Governance].

(30) It is necessary to set transparent and unambiguous rules for calculating the share of energy from renewable sources and for defining those sources.

(31) In calculating the contribution of hydropower and wind power for the purposes of this Directive, the effects of climatic variation should be smoothed through the use of a normalisation rule. Further, electricity produced in pumped storage units from water that has previously been pumped uphill should not be considered to be electricity produced from renewable energy sources.

(32) Heat pumps enabling the use of ***ambient and*** geothermal ***energy*** at a useful temperature level ***or systems providing cooling*** need electricity or other auxiliary energy to function. The energy used to drive ***these systems*** should therefore be deducted from the total usable ***energy or energy removed from the area. Only such heating and cooling systems where the output or energy removed from an area*** significantly exceeds the primary energy needed to drive it should be taken into account. ***Cooling systems contribute to the energy use in Member States and it is therefore appropriate that the calculation methods take into account the renewable share of the energy used in such systems in all end use sectors.***

(33) Passive energy systems use building design to harness energy. This is considered to be saved energy. To avoid double counting, energy harnessed in this way should not be taken into account for the purposes of this Directive.

(34) Some Member States have a large share of aviation in their gross final consumption of energy. In view of the current technological and regulatory constraints that prevent the commercial use of biofuels in aviation, it is appropriate to provide a partial exemption for such Member States, by excluding from the calculation of their gross final consumption of energy in national air transport, the amount by which they exceed one-and-a-half times the Union average gross final consumption of energy in aviation in 2005, as assessed by Eurostat, i.e. 6,18 %. Cyprus and Malta, due to their insular and peripheral character, rely on aviation as a mode of transport, which is essential for their citizens and their economy. As a result, Cyprus and Malta have a gross final consumption of energy in national air transport which is disproportionally high, i.e. more than three times the Union average in 2005, and are thus disproportionately affected by the current technological and regulatory constraints. For those Member States it is therefore appropriate to provide that the exemption should cover the amount by which they exceed the Union average gross final consumption of energy in aviation in 2005 as assessed by Eurostat, i.e. 4,12 %.

(35) The communication of the Commission of 20 July 2016 entitled "A European Strategy for Low-Emission mobility" highlighted the particular importance, in the medium-term, of advanced biofuels and fuels of non-biological origin for aviation.

(36) In order to ensure that Annex IX takes into account the principles of the waste hierarchy established in Directive 2008/98/EC of the European Parliament and of the Council▌, the Union sustainability criteria, and the need to ensure that the Annex does not create additional demand for land while promoting the use of wastes and residues, the Commission, when regularly evaluating the Annex, should consider the inclusion of additional feedstocks that do not cause significant distortive effects on markets for (by-)products, wastes or residues.

(37) To create opportunities for reducing the cost of meeting the Union target laid down in this Directive and to give flexibility to Member States to comply with their obligation not to go below their 2020 national targets after 2020 , it is appropriate both to facilitate the consumption in Member States of energy produced from renewable sources in other Member States, and to enable Member States to count energy from renewable sources consumed in other Member States towards their own renewable energy share▌***. For this reason, a European Union Renewable Energy Platform ("ERDP") will be put in place, enabling trading renewable energy shares between Member States, in addition to bilateral cooperation agreements. This shall complement voluntary opening of*** support ***schemes*** to projects located in other Member States***. The agreements between Member States*** include statistical transfers, joint projects between Member States or joint support schemes.

(38) Member States should be encouraged to pursue all appropriate forms of cooperation in relation to the objectives set out in this Directive ***and to inform citizens about the benefits stemming from the use of cooperation mechanisms***. Such cooperation can take place at all levels, bilaterally or multilaterally. Apart from the mechanisms with effect on target renewable energy share calculation and target compliance, which are exclusively provided for in this Directive, namely statistical transfers between Member States ***done bilaterally or via the ERDP***, joint projects and joint support schemes, cooperation can also take the form of, for example, exchanges of information and best practices, as provided for, in particular, in the e-platform established by Regulation [Governance], and other voluntary coordination between all types of support schemes.

(39) It should be possible for imported electricity, produced from renewable energy sources outside the Union to count towards Member States' renewable energy shares In order to guarantee an adequate effect of energy from renewable sources replacing conventional energy in the Union as well as in third countries it is appropriate to ensure that such imports can be tracked and accounted for in a reliable way. Agreements with third countries concerning the organisation of such trade in electricity from renewable energy sources will be considered. If, by virtue of a decision taken under the Energy Community Treaty to that effect, the contracting parties to that Treaty are bound by the relevant provisions of this Directive, the measures of cooperation between Member States provided for in this Directive should be applicable to them.

(40) ***When Member States undertake joint projects with one or more third countries regarding the production of electricity from renewable energy sources, it is appropriate that those joint projects relate only to newly constructed installations or to installations with newly increased capacity. This will help ensure that the proportion of energy from renewable sources in the third country's total energy consumption is not reduced due to the importation of energy from renewable sources into the Union.***

(41) ***While this Directive establishes a Union Framework for the promotion of energy from renewable sources, it also contributes to the potential positive impact which the Union and the Member States can have in boosting the development of renewable energy sector in third countries. The Union and the Member States should promote research, development and investment in the renewable energy production in developing and other partner countries with full respect of international law, thereby strengthening their environmental and economic sustainability and their export capacity of renewable energy.***

(42) The procedure used for the authorisation, certification and licensing of renewable energy plants should be objective, transparent, non-discriminatory and proportionate when applying the rules to specific projects. In particular, it is appropriate to avoid any unnecessary burden that could arise by classifying renewable energy projects under installations which represent a high health risk.

(43) For the benefit of rapid deployment of energy from renewable sources and in view of their overall high sustainable and environmental beneficial quality, Member States should, when applying administrative rules, planning structures and legislation which are designed for licensing installations with respect to pollution reduction and control for industrial plants, for combating air pollution and for the prevention or minimisation of the discharge of dangerous substances in the environment, take into account the contribution of renewable energy sources towards meeting environmental and climate change objectives, in particular when compared to non-renewable energy installations.

(44) The coherence between the objectives of this Directive and the Union's other environmental legislation should be ensured. In particular, during the assessment, planning or licensing procedures for renewable energy installations, Member States should take account of all Union environmental legislation and the contribution made by renewable energy sources towards meeting environmental and climate change objectives, in particular when compared to non-renewable energy installations.

▌

(45) ***Geothermal energy is an important local renewable energy source which usually has considerably lower emissions than fossil fuels and certain types of geothermal plants produce near-zero emission. However, depending on the geological characteristics of an area, geothermal energy production may release greenhouse gases and other substances from underground fluids and other subsoil geological formations, which are harmful for health and the environment. Therefore, the European Commission should only facilitate the deployment of geothermal energy with low environmental impact and resulting in greenhouse gas saving compared to conventional sources.***

(46) At national ▌***,*** regional ***and where applicable local*** level, rules and obligations for minimum requirements for the use of energy from renewable sources in new and renovated buildings have led to considerable increases in the use of energy from renewable sources. Those measures should be encouraged in a wider Union context, while promoting the use of more energy-efficient applications of energy from renewable sources ***in combination with energy saving and energy efficiency measures*** through building regulations and codes.

(47) In order to facilitate and accelerate the setting of minimum levels for the use of energy from renewable sources in buildings, the calculation of those minimum levels in new and existing buildings subject to major renovation should ▌***provide sufficient basis for assessing whether the inclusion of minimum levels of renewables is technically, functionally and economically feasible. Member States should among other means allow the use of efficient district heating and cooling as well as other energy infrastructure, where district heating and cooling networks are not available, to fulfil these requirements***.

(48) To ensure that national measures for developing renewable heating and cooling are based on comprehensive mapping and analysis of the national renewable and waste energy potential and provide for increased integration of renewable energy***, by supporting inter alia innovative technologies such as heat pumps, geothermal and solar thermal technologies,*** and waste heat and cold sources, it is appropriate to require that Member States carry out an assessment of their national potential of renewable energy sources and the use of waste heat and cold for heating and cooling, in particular to facilitate mainstreaming renewable energy in heating and cooling installations and promote efficient and competitive district heating and cooling as defined by Article 2(41) of Directive 2012/27/EU of the European Parliament and of the Council ▌[21]**.** To ensure consistency with energy efficiency requirements for heating and cooling and reduce administrative burden this assessment should be included in the comprehensive assessments carried out and notified in accordance with Article 14 of that Directive.

(49) The lack of transparent rules and coordination between the different authorisation bodies has been shown to hinder the deployment of energy from renewable sources. ***Providing guidance to the applicants throughout their permit-granting processes through an*** administrative contact point ▌ should reduce complexity ***for the project developer*** and increase efficiency and transparency ▌***, including for renewable self-consumers and renewable energy communities. Guidance should be provided at an appropriate level of governance, taking into account the specificities of Member States. The single contact points should be able to guide the applicant and facilitate through the entire administrative process so that the applicant is not obliged to contact other administrative bodies in order to complete the permit granting process, unless the applicant prefers to do so***.

▌ Lengthy administrative procedures constitute a major administrative barrier and are costly. The simplification of permit-granting processes, ***and*** a clear time-limit for the decision to be taken by the ***relevant authorities competent in issuing the authorization for the electricity generation installation on the basis of a completed application*** should stimulate a more efficient handling of procedures thus reducing administrative costs. ▌ ***A manual of procedures should be made available to facilitate the understanding of procedures for project developers and citizens wishing to invest in renewable energy sources***. ▌ In order to ***foster*** the ***uptake of renewables*** by micro, small and medium-sized enterprises (SMEs) and individual citizens ***in line with*** the objectives set out in this Directive, ▌ simple notifications ***procedures for grid connections*** to the competent body ***should be established*** for small renewable energy projects, including decentralised ones such as rooftop solar installations. ***In order to respond to*** the increasing need for the repowering of existing renewables plants, ***streamlined*** permit granting procedures should be set out ***. This Directive, in particular the provisions on the organisation and duration of the permit granting process, should apply without prejudice to international and Union law, including provisions to protect the environment and human health. In case of extraordinary circumstances, which should be duly justified, initial timeframes can be extended by up to one year***.

(50) Information and training gaps, especially in the heating and cooling sector, should be removed in order to encourage the deployment of energy from renewable sources.

(51) In so far as the access or pursuit of the profession of installer is a regulated profession, the preconditions for the recognition of professional qualifications are laid down in Directive 2005/36/EC of the European Parliament and of the Council[1]. This Directive therefore applies without prejudice to Directive 2005/36/EC.

(52) While Directive 2005/36/EC lays down requirements for the mutual recognition of professional qualifications, including for architects, there is a further need to ensure that architects and planners properly consider an optimal combination of renewable energy sources and high-efficiency technologies in their plans and designs. Member States should therefore provide clear guidance in this regard. This should be done without prejudice to the provisions of Directive 2005/36/EC and in particular Articles 46 and 49 thereof.

(53) Guarantees of origin issued for the purpose of this Directive have the sole function of showing to a final customer that a given share or quantity of energy was produced from renewable sources. A guarantee of origin can be transferred, independently of the energy to which it relates, from one holder to another. However, with a view to ensuring that a unit of renewable energy is disclosed to a customer only once, double counting and double disclosure of guarantees of origin should be avoided. Energy from renewable sources in relation to which the accompanying guarantee of origin has been sold separately by the producer should not be disclosed or sold to the final customer as energy from renewable sources. ***It is important to distinguish between green certificates used for support schemes and guarantees of origin.***

[1] Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications (OJ L 255, 30.9.2005, p. 22).

(54) It is appropriate to allow the consumer market for electricity from renewable energy sources to contribute to the development of energy from renewable sources. Member States should therefore require electricity suppliers who disclose their energy mix to final customers in accordance with Article X of Directive [Market Design], or who market energy to consumers with a reference to the consumption of energy from renewable sources, to use guarantees of origin from installations producing energy from renewable sources.

(55) It is important to provide information on how the supported electricity is allocated to final customers . In order to improve the quality of that information to consumers, Member States should ensure that guarantees of origin are issued for all units of renewable energy produced***, except for when they decide not to issue guarantees of origin to producers who also receive financial support. If Member States decide to issue guarantees of origin in such a case, or they decide not to issue them directly to producers, they shall be able to choose by which means and mechanisms to take into account their market value. When*** renewable energy producers ***also receive*** financial support***, the market value of the*** guarantees of origin ***for the same production shall be appropriately taken into account in*** the relevant ***support scheme.***

(56) Directive 2012/27/EU provides for guarantees of origin for proving the origin of electricity produced from high-efficiency cogeneration plants. However, no use is specified for such guarantees of origin , so ***their use may*** also be ***enabled*** when disclosing the use of energy from high efficiency CHP.

(57) Guarantees of origin, which are currently in place for renewable electricity ▌, should be extended to cover renewable gas. ***Extending the guarantees of origin system to non-renewable energy sources should be an option for Member States.*** This would provide a consistent means of proving to final customers the origin of renewable gases such as biomethane and would facilitate greater cross-border trade in such gases. It would also enable the creation of guarantees of origin for other renewable gases such as hydrogen.

(58) There is a need to support the integration of energy from renewable sources into the transmission and distribution grid and the use of energy storage systems for integrated variable production of energy from renewable sources, in particular as regards the rules regulating dispatch and access to the grid. Directive [Electricity Market Design] lays down the framework for the integration of electricity from renewable energy sources. However, this framework does not include provisions on the integration of gas from renewable energy sources into the gas grid. It is therefore necessary to keep them in this Directive .

(59) The opportunities for establishing economic growth through innovation and a sustainable competitive energy policy have been recognised. Production of energy from renewable sources often depends on local or regional SMEs. The opportunities for ***local business development, sustainable*** growth and ***high-quality*** employment that investments in regional and local production of energy from renewable sources bring about in the Member States and their regions are important. The Commission and the Member States should therefore ***foster and*** support national and regional development measures in those areas, encourage the exchange of best practices in production of energy from renewable sources between local and regional development initiatives and ***enhance the provision of technical assistance and training programmes, in order to strengthen regulatory, technical and financial expertise on the ground and foster knowledge on available funding possibilities, including a more targeted use of Union funds, such as*** the use of cohesion policy funding in this area.

(60) ***Local and regional authorities often set more ambitious renewable targets in excess of national targets. Regional and local commitments to stimulating development of renewables and energy efficiency are currently supported through networks, such as the Covenant of Mayors, Smart Cities or Smart Communities initiatives, and the development of sustainable energy action plans. Such networks are indispensable and should be expanded, as they raise awareness and facilitate exchanges of best practices and available financial support. In that context, the Commission should also support interested frontrunner regions and local authorities to work across borders by assisting in setting up cooperation mechanisms, such as European Grouping of Territorial Cooperation that enables public authorities of various Member States to team up and deliver joint services and projects, without requiring a prior international agreement to be signed and ratified by national parliaments.***

(61) ***Other innovative measures to attract more investment into new technologies, such as energy performance contracts and standardisation processes in public financing should also be considered.***

(62) When favouring the development of the market for renewable energy sources, it is necessary to take into account the positive impact on regional and local development opportunities, export prospects, social cohesion and employment opportunities, in particular as concerns SMEs and independent energy producers***, including renewable self-consumers and renewable energy communities***

(63) The specific situation of the outermost regions is recognised in Article 349 of the Treaty on the Functioning of the European Union. The energy sector in the outermost regions is often characterised by isolation, limited supply and dependence on fossil fuels while these regions benefit from important local renewable sources of energy. The outermost regions could thus serve as examples of the application of innovative energy technologies for the Union. It is therefore necessary to promote the uptake of renewable energy in order to achieve a higher degree of energy autonomy for those regions and recognise their specific situation in terms of renewable energy potential and public support needs. ***Provision should be made for a derogation of limited local impact that allows Member States to adopt specific criteria in order to ensure eligibility for financial support for the consumption of certain biomass fuels. Member States should be able to adopt such specific criteria for installations using biomass fuel and located in an outermost region as referred to in Article 349 TFEU, as well as for biomass that is used as fuel in the said installations and that does not comply with the harmonised sustainability, energy efficiency and greenhouse gas emissions savings criteria of this Directive. Such specific criteria for biomass fuels should apply irrespective of the place origin of that biomass in any Member State or third country. Moreover, any specific criteria should be objectively justified for reasons of energy independence of the outermost region concerned and of ensuring a smooth transition to the sustainability, energy efficiency and greenhouse gas emissions saving criteria for biomass fuels of this Directive in such an outermost region. Considering that the energy mix for electricity generation for the outermost regions is essentially made up to a large extent of fuel oil, it is necessary to allow to appropriately consider greenhouse gas emissions saving criteria in these regions. It would therefore be appropriate to provide a specific fossil fuel comparator for the electricity produced in the outermost regions. Member States should ensure effective compliance with the specific criteria which they adopted. Finally, national specific criteria should in any event be without prejudice to Article 26(9) of this Directive. This ensures that biofuels and bioliquids compliant with the harmonised criteria of this Directive will continue to benefit from the trade facilitation pursued by this Directive, including as regards the outermost regions concerned.***

(64) It is appropriate to allow for the development of decentralised renewable energy technologies ***and storage*** under non-discriminatory conditions and without hampering the financing of infrastructure investments . The move towards decentralised energy production has many benefits, including the utilisation of local energy sources, increased local security of energy supply, shorter transport distances and reduced energy transmission losses. Such decentralisation also fosters community development and cohesion by providing income sources and creating jobs locally.(53) With the growing importance of self-consumption of renewable electricity, there is a need for a definition of renewable self-consumers and ***jointly acting self-consumers as well as*** a regulatory framework which would empower self-consumers to generate, store, consume and sell electricity without facing disproportionate burdens. ***Citizens*** living in apartments for example ***should be able to*** benefit from consumer empowerment to the same extent as households in single family homes. ***However, Member States should be allowed to differentiate between individual self-consumers and jointly acting self-consumers due to their different characteristics to the extent that any different treatment is proportionate and duly justified.***

(65) Empowering jointly acting renewable self-consumers also provides opportunities for renewable energy communities to advance energy efficiency at household level and help fight energy poverty through reduced consumption and lower supply tariffs. Member States should take appropriate advantage of this opportunity by, inter alia, assessing the possibility to enable participation by households that might otherwise not be able to participate, including vulnerable consumers and tenants.

(66) ***Renewable self-consumers should not face discriminatory or disproportionate burdens and costs and should not be subject to unjustified charges. Their contribution to the achievement of the climate and energy target and the costs and benefits they induce in the wider energy system should be taken into account. To this extent Member States should generally not charge electricity produced and consumed within the same premises by renewable self-consumers. However, Member States should be allowed to apply non-discriminatory and proportionate charges to this electricity if necessary to ensure financial sustainability of the electric system, to limit the support to what is objectively needed and to make efficient use of their support systems. At the same time Member States should ensure that self-consumers contribute in a balanced and adequate way to the overall cost-sharing system of producing, distributing and consuming electricity, when electricity is injected into the grid.***

(67) ***To this end Member States should as a general principle not charge electricity individually produced and consumed by renewable self-consumers within the same premises. However, in order to avoid that this incentive is affecting the financial stability of renewables support schemes, this incentive could be limited to small installations not larger than 30 kW. In certain cases, Member States should be allowed to apply charges to self-consumers for self-consumed electricity in case they make efficient use of their support schemes and apply non-discriminatory and effective access to their support schemes. Member States may apply partial exemptions from charges, levies, or a combination thereof and support, up to the level needed to ensure the economic viability of such projects.***

(68) ***The*** participation ***of local citizens and local authorities*** in renewable energy projects through renewable energy communities has resulted in substantial added value in terms of local acceptance of renewable energy and access to additional private capital ***which results in local investment, more choice for consumers and greater participation by citizens in the energy transition***. This local involvement will be all the more crucial in a context of increasing renewable energy capacity in the future. ***Measures to allow renewable energy communities to compete on an equal footing with other producers also aim to increase local citizen participation in renewable energy projects and therefore increase acceptance for renewable energies.***

(69) The specific characteristics of local renewable energy communities in terms of size, ownership structure and the number of projects can hamper their competition on equal footing with large-scale players, namely competitors with larger projects or portfolios. ***Therefore it should be possible for Member States to choose any form of entity for energy communities as long as such an entity may, acting in its own name, exercise rights and be subject to obligations. To avoid abuse and ensure broad participation, renewable energy communities should be capable of remaining autonomous from individual members and other traditional market actors that participate in the community as members or shareholders, or who cooperate through other means such as investment. Participation in renewable energy generation projects should be open to all potential local members based on non-discriminatory criteria.*** Measures to offset those disadvantages include enabling energy communities to operate in the energy system and easing their market integration. ***Renewable energy communities should be able to share between themselves energy that is produce by their community-owned installations. However, community members should not be exempt from appropriate costs, charges, levies and taxes that would be borne by non-community member final consumers or generators in a similar situation or when any kind of public grid infrastructure is used for these transfers.***

(70) Representing around half of the final energy consumption of the Union, heating and cooling is considered to be a key sector in accelerating the decarbonisation of the energy system. Moreover, it is also a strategic sector in terms of energy security, as it is projected that around 40 % of the renewable energy consumption by 2030 should come from renewable heating and cooling. The absence of a harmonised strategy at Union level, the lack of internalisation of external costs and the fragmentation of heating and cooling markets have led to relatively slow progress in this sector so far.

(71) Several Member States have implemented measures in the heating and cooling sector to reach their 2020 renewable energy target. However, in the absence of binding national targets post-2020, the remaining national incentives may not be sufficient to reach the long-term decarbonisation goals for 2030 and 2050. In order to be in line with such goals, reinforce investor certainty and foster the development of a Union-wide renewable heating and cooling market, while respecting the energy efficiency first principle, it is appropriate to encourage the effort of Member States in the supply of renewable heating and cooling to contribute to the progressive increase of the share of renewable energy. Given the fragmented nature of some heating and cooling markets, it is of utmost importance to ensure flexibility in designing such an effort. It is also important to ensure that a potential uptake of renewable heating and cooling does not have detrimental environmental side-effects ***or lead to disproportionate overall costs. In order to minimise this risk, the increase of the share of renewable energy in heating and cooling should take into account the situation of those Member States where this share is already very high, or Member States where waste heat and cold is not used such as Cyprus and Malta***.

(72) District heating and cooling currently represents around 10 % of the heat demand across the Union, with large discrepancies between Member States. The Commission's heating and cooling strategy has recognised the potential for decarbonisation of district heating through increased energy efficiency and renewable energy deployment.

(73) The Energy Union strategy also recognised the role of the citizen in the energy transition, where citizens take ownership of the energy transition, benefit from new technologies to reduce their bills, and participate actively in the market.

(74) Household consumers and communities engaging in self-consumption shall maintain their rights as consumers, including the rights to have a contract with a supplier of their choice and switching supplier.

(75) The potential synergies between an effort to increase the uptake of renewable heating and cooling and the existing schemes under Directives 2010/31/EU and 2012/27/EU should be emphasised. Member States should, to the extent possible, have the possibility to use existing administrative structures to implement such effort, in order to mitigate the administrative burden.

(76) In the area of district heating, it is therefore crucial to enable the fuel-switching to ***renewable energy sources*** and prevent regulatory and technology lock-in and technology lock-out through reinforced rights for renewable energy producers and final consumers, and bring the tools to ***final*** consumers to facilitate their choice between the highest energy performance solution that take into account future heating and cooling needs in line with expected building performance criteria. ***The final consumers should be given transparent and reliable information on the efficiency of the district heating and cooling system and the share of renewable energy sources in their specific heat or cooling supply.***

(77) In the area of Intelligent Transport it is important to increase the development and deployment of electric mobility for road, as well as to accelerate the integration of advanced technologies into innovative rail.

(78) In order to protect consumers in non-efficient district heating and cooling systems and allow them to produce their heating or cooling from renewable energy sources and with significantly better energy performance, they should be entitled to disconnect and thus discontinue the heating or cooling service from non-efficient district heating and cooling at whole building level by terminating their contract or, where the contract covers several buildings, by modifying the contract with the district heating or cooling operator.

(79) ▌To prepare for the transition towards advanced biofuels and minimise the overall ***direct and*** indirect land-use change impacts, it is appropriate to ***limit*** the amount of biofuels and bioliquids produced from ***cereal and other starch-rich crops, sugars and oil*** crops that can be counted towards the ***targets set out in this Directive, without restricting the overall possibility to use such biofuels and bioliquids. The establishment of a limit at Union level should not prevent Member States from providing for lower limits on the amount of biofuels and bioliquids produced from cereal and other starch-rich crops, sugars and oil crops that can be counted at national level towards the targets*** set out in this Directive***, without restricting the overall possibility to use such biofuels and bioliquids***.

(80) Directive 2009/28/EC introduced a set of sustainability criteria including criteria protecting land with high biodiversity value and land with high carbon stock but did not cover the issue of indirect land use change. Indirect land-use change occurs when the cultivation of crops for biofuels, bioliquids and biomass fuels displaces traditional production of crops for food and feed purposes. This additional demand may increase the pressure on land and can lead to the extension of agricultural land into areas with high carbon stock such as forests, wetlands and peat land causing additional greenhouse gas emissions. Directive (EU) 2015/1513 recognised that the magnitude of greenhouse gas emissions-linked indirect land-use change could negate some or all greenhouse gas emission savings of individual biofuels, bioliquids or biomass fuels. While there are risks stemming from indirect land use change , research has shown that the scale of the effect depends on many factors, including the type of feedstock used for fuel production, the level of additional feedstock demand triggered by the use of biofuels, bioliquids and biomass fuels and the extent to which land with high carbon stock is protected across the globe. While the level of greenhouse gas emissions caused by indirect land-use change cannot at present be unequivocally determined with the level of precision required to be included in the greenhouse gas emission calculation methodology, the highest risks of indirect land-use change have been identified for biofuels, bioliquids and biomass fuels produced from feedstocks for which a significant expansion of the production area into land with high carbon stock is observed. Therefore, it is appropriate to limit food and feed crop-based biofuels, bioliquids and biomass fuels promoted under this Directive in general and in addition to require Member States to set a specific and gradually decreasing limit for biofuels, bioliquids and biomass fuels produced from food and feed crops for which a significant expansion of the production area into land with high carbon stock is observed whereas low indirect land-use change-risk biofuels, bioliquids and biomass fuels should be exempted from the specific and gradually decreasing limit.

(81) ***Yield increases in agricultural sectors through improved agricultural practises, investments into better machinery and knowledge transfer [beyond levels which would have prevailed in the absence of productivity-promoting schemes for food and feed crop-based biofuels, bioliquids and biomass fuels, as well as the cultivation of crops on areas which were previously not used for cultivation of crops, can mitigate indirect land-use change. In case there is evidence that such measures have led to an increase of the production going beyond the expected increase in productivity, biofuels, bioliquids and biomass fuels produced from such additional feedstock should be considered as low indirect land-use change-risk biofuels. Annual yield fluctuations, should be accounted for in the process.***

(82) Directive (EU) 2015/1513 of the European Parliament and of the Council▌ called on the Commission to present without delay a comprehensive proposal for a cost-effective and technology-neutral post-2020 policy in order to create a long-term perspective for investment in sustainable biofuels with a low risk of causing indirect land-use change ***with a headline target*** of decarbonising the transport sector. An ▌obligation on ***Member States to require*** fuel suppliers ***to deliver an overall share of fuels from renewable energy sources*** can provide certainty for investors and encourage the continuous development of alternative renewable transport fuels including advanced biofuels, renewable liquid and gaseous transport fuels of non-biological origin, and renewable electricity in transport. ***Since renewable alternatives might not be freely and cost-efficiently available for all fuel suppliers, it is appropriate to allow Member States to distinguish between them and to exempt, if necessary, types of fuel suppliers from the obligation***. As transport fuels are traded easily, fuel suppliers in Member States with low endowments of the relevant resources should be able to easily obtain renewable fuels from elsewhere.

(83) ***A European database should be put in place to ensure transparency and traceability of renewable fuels. While Member States should be allowed to continue to use or establish national databases, these databases should be linked to the European database, in order to ensure instant data transfers and harmonisation of data flows.***

(84) Advanced biofuels and other biofuels and biogas produced from feedstock listed in Annex IX, renewable liquid and gaseous transport fuels of non-biological origin, and renewable electricity in transport can contribute to low carbon emissions, stimulating the decarbonisation of the Union transport sector in a cost-effective manner, and improving inter alia energy diversification in the transport sector while promoting innovation, growth and jobs in the Union economy and reducing reliance on energy imports. ***An*** obligation on ***Member States to require fuel*** suppliers ***a share of advanced biofuels,*** should encourage continuous development of advanced fuels, including biofuels, and it is important to ensure that the incorporation obligation also incentivises improvements in the greenhouse gas performance of the fuels supplied to meet it. The Commission should assess the greenhouse gas performance, technical innovation and sustainability of those fuels.

(*85)* ***Electromobility is expected to constitute a substantial part of the renewable energy in the transport sector by the year 2030. Further incentives should be provided considering the swift development of electromobility and the potential of this sector in terms of growth and job for the European Union. Multipliers for renewable electricity supplied for the transport sector should be used for the promotion of using electricity in transport and in order to reduce the comparative disadvantage in energy statistics. Since it is not possible to account for all electricity supplied for road vehicles in statistics through dedicated metering (e.g. charging at home), thus multipliers should be used to ensure positive impacts of electrified renewable energy-based transport are properly accounted for. Options should be explored to ensure that the new electricity demand in the transport sector is met with additional generation capacity of renewable energy sources.***

(86) ***In light of climatic constraints that limit the possibility to consume certain types of biofuels due to environmental, technical and health concerns, and due to the size and structure of the fuel market, it is appropriate that Cyprus and Malta should, for the purposes of demonstrating compliance with national renewable energy obligations placed on fuels suppliers, be allowed to take into account these inherent limitations.***

(87) ***The promotion of recycled carbon fuels can also contribute towards the policy objectives of energy diversification and transport decarbonisation when they fulfil the appropriate minimum greenhouse gas savings thresholds. It is therefore appropriate to include those fuels in the obligation on fuel suppliers, whilst giving Member States the option not to consider these fuels in the obligation if they do not wish to do so. Since those fuels are of non-renewable nature, they should not be counted towards the overall EU-target for energy from renewable sources.***

(88) ***Renewable fuels of non-biological origin are important to increase the share of renewable energy in sectors that are expected to rely on liquid fuels in the long term. To ensure that renewable fuels of non-biological origin contribute to greenhouse gas reduction, the electricity used for the fuel production should be of renewable origin. If the electricity is taken from the grid, this requires a reliable European methodology to be developed by the European Commission. Therefore the methodology should ensure that there is a temporal and geographical correlation between the electricity production unit, which the producer has a bilateral renewables power purchase agreement with, and the fuel production. One example is that renewable fuels of non-biological origin cannot be counted as fully renewable, if they are produced at the time when the contracted renewable generation unit is not generating electricity. Another example is that in case of an electricity grid congestion, fuels can only be counted as fully renewable when both the electricity generation and the fuel production plants are located on the same site of the congestion. Furthermore there should be an element of additionality, meaning that the fuel producer is adding to the renewable deployment or to the financing of renewables.***

(89) Feedstocks which have low indirect land use change impacts when used for biofuels, should be promoted for their contribution to the decarbonisation of the economy. Especially feedstocks for advanced biofuels, for which technology is more innovative and less mature and therefore needs a higher level of support, should be included in an annex to this Directive. In order to ensure that this annex is up to date with the latest technological developments while avoiding unintended negative effects, an evaluation should take place after the adoption of the Directive in order to assess the possibility to extend the annex to new feedstocks.

(90) The costs of connecting new producers of gas from renewable energy sources to the gas grids should be based on objective, transparent and non-discriminatory criteria and due account should be taken of the benefit that embedded local producers of gas from renewable sources bring to the gas grids.

(91) In order to exploit the full potential of biomass***, which does not include peat and material embedded in geological formations and/or transformed to fossil,*** to contribute to the decarbonisation of the economy through its uses for materials and energy , the Union and the Member States should promote greater sustainable mobilisation of existing timber and agricultural resources and the development of new forestry and agriculture production systems ***provided that sustainability and greenhouse gas emissions saving criteria are met***.

(92) Biofuels , bioliquids and biomass fuels should always be produced in a sustainable manner. Biofuels, bioliquids and biomass fuels used for compliance with the Union target laid down in this Directive, and those which benefit from support schemes, should therefore be required to fulfil sustainability and greenhouse gas emissions ***savings criteria. The harmonisation of these criteria for biofuels and bioliquids is essential for the achievement of energy policy objectives of the Union as set out in Article 194(1) of Treaty on the Functioning of the European Union. In this context, it ensures the functioning of the internal energy market and thus facilitates, especially with regard to Article 26(9) of this Directive, trade between Member States in compliant biofuels and bioliquids. The positive effects of the harmonisation of the above criteria on the smooth functioning of the internal energy market and on the avoidance of distortion of competition in the Union cannot be frustrated. For biomass fuels Member States should be allowed to place additional sustainability and greenhouse gas emissions*** savings criteria.

(93) The Union should take appropriate steps in the context of this Directive, including the promotion of sustainability and greenhouse gas emissions savings criteria for biofuels , and for bioliquids and biomass fuels used for heating or cooling and electricity generation .

(94) The production of agricultural raw material for biofuels, bioliquids and biomass fuels , and the incentives for their use provided for in this Directive, should not have the effect of encouraging the destruction of biodiverse lands**.** Such finite resources, recognised in various international instruments to be of value to all mankind, should be preserved. It is therefore necessary to provide sustainability and greenhouse gas emissions savings criteria ensuring that biofuels, bioliquids and biomass fuels qualify for the incentives only when it is guaranteed that the agricultural raw material does not originate in biodiverse areas or, in the case of areas designated for nature protection purposes or for the protection of rare, threatened or endangered ecosystems or species, the relevant competent authority demonstrates that the production of the agricultural raw material does not interfere with such purposes.

(95) Forests should be considered as biodiverse according to the ***sustainability*** criteria, where they are primary forests in accordance with the definition used by the Food and Agriculture Organisation of the United Nations (FAO) in its Global Forest Resource Assessment, or where they are protected by national nature protection law. Areas where the collection of non-wood forest products occurs should be considered to be biodiverse forests , provided the human impact is small. Other types of forests as defined by the FAO, such as modified natural forests, semi-natural forests and plantations, should not be considered as primary forests. Having regard, furthermore, to the highly biodiverse nature of certain grasslands, both temperate and tropical, including highly biodiverse savannahs, steppes, scrublands and prairies, biofuels , bioliquids and biomass fuels made from agricultural raw materials originating in such lands should not qualify for the incentives provided for by this Directive. The Commission should establish appropriate criteria to define such highly biodiverse grasslands in accordance with the best available scientific evidence and relevant international standards.

(96) Land should not be converted for the production of agricultural raw material for biofuels , bioliquids and biomass fuels if its carbon stock loss upon conversion could not, within a reasonable period, taking into account the urgency of tackling climate change, be compensated by the greenhouse gas emission saving resulting from the production and use of biofuels, bioliquids and biomass fuels. This would prevent unnecessary, burdensome research by economic operators and the conversion of high-carbon-stock land that would prove to be ineligible for producing agricultural raw materials for biofuels bioliquids and biomass fuels. Inventories of worldwide carbon stocks indicate that wetlands and continuously forested areas with a canopy cover of more than 30 % should be included in that category.

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(97) In the framework of the Common Agricultural Policy Union, farmers should comply with a comprehensive set of environmental requirements in order to receive direct support. Compliance with those requirements can be most effectively verified in the context of agricultural policy. Including those requirements in the sustainability scheme is not appropriate as the sustainability criteria for bioenergy should set out rules that are objective and apply globally. Verification of compliance under this Directive would also risk causing unnecessary administrative burden.

(98) Agricultural feedstock for the production of biofuels, bioliquids and biomass fuels should be produced using practices that are consistent with the protection of soil quality and soil organic carbon. Soil quality and soil carbon should therefore be covered by monitoring systems of operators or national authorities.

(99) It is appropriate to introduce Union-wide sustainability and greenhouse gas emission saving criteria for biomass fuels used in the electricity and heating and cooling generation, in order to continue to ensure high greenhouse gas savings compared to fossil fuel alternatives, to avoid unintended sustainability impacts, and to promote the internal market. ***The outermost regions should be able to use the potential of their resources in order to increase the production of renewable energies and their energy independence.***

(100) To ensure that, despite the growing demand for forest biomass, harvesting is carried out in a sustainable manner in forests where regeneration is ensured, that special attention is given to areas explicitly designated for the protection of biodiversity, landscapes and specific natural elements, that biodiversity resources are preserved and that carbon stocks are tracked, woody raw material should come only from forests that are harvested in accordance with the principles of sustainable forest management developed under international forest processes such as Forest Europe and are implemented through national laws or the best management practices at the ***sourcing area*** level. Operators should take the appropriate steps in order to minimise the risk of using unsustainable forest biomass for the production of bioenergy. To that end, operators should put in place a risk-based approach. In this context, it is ***appropriate*** for the Commission to develop operational guidance on the verification of compliance with the risk based approach, following the consultation of the ***Committee on the Sustainability of Biofuels, Bioliquids and Biomass fuels.***

(101) Harvesting for energy purposes has increased and is expected to continue to grow, resulting in higher imports of raw materials from third countries as well as an increase of the production of those materials within the Union. It should be ensured that harvesting is sustainable.

(102) In order to minimise the administrative burden, the Union sustainability and greenhouse gas saving criteria should apply only to electricity and heating from biomass fuels produced in installations with a ***total rated thermal input*** equal or above to 20 MW.

(103) Biomass fuels should be converted into electricity and heat in an efficient way in order to maximise energy security and greenhouse gas savings, as well as to limit emissions of air pollutants and minimise the pressure on limited biomass resources. ▌

(104) The minimum greenhouse gas emission savings threshold for biofuels and bioliquids produced in new installations should be increased in order to improve their overall greenhouse gas balance as well as to discourage further investments in installations with a low greenhouse gas emission savings performance. This increase provides investment safeguards for biofuels and bioliquids production capacities.

(105) Based on experience in the practical implementation of the Union sustainability criteria, it is appropriate to strengthen the role of voluntary international and national certification schemes for verification of compliance with the sustainability criteria in a harmonised manner.

(106) It is in the interests of the Union to encourage the development of voluntary international or national schemes that set standards for the production of sustainable biofuels, bioliquids , and biomass fuels and that certify that the production of biofuels, bioliquids , and biomass fuels meets those standards. For that reason, provision should be made for schemes should be recognised as providing reliable evidence and data, where they meet adequate standards of reliability, transparency and independent auditing. In order to ensure that the compliance with the sustainability and greenhouse gas emissions savings criteria is verified in a robust and harmonised manner and in particular to prevent fraud, the Commission should be empowered to set out detailed implementing rules, including adequate standards of reliability, transparency and independent auditing to be applied by the voluntary schemes.

(107) Voluntary schemes play an increasingly important role in providing evidence of compliance with the sustainability and greenhouse gas emissions saving criteria for biofuels, bioliquids and biomass fuels. It is therefore appropriate for the Commission to require voluntary schemes, including those already recognised by the Commission, to report regularly on their activity. Such reports should be made public in order to increase transparency and to improve supervision by the Commission. Furthermore, such reporting would provide the necessary information for the Commission to report on the operation of the voluntary schemes with a view to identifying best practice and submitting, if appropriate, a proposal to further promote such best practice.

(108) To facilitate the functioning of the internal market, evidence regarding the sustainability and greenhouse gas emissions criteria for biomass for energy that has been obtained in accordance with a scheme that has been recognised by the Commission should be accepted in all Member States. Member States should contribute towards ensuring the correct implementation of the certification principles of voluntary schemes by supervising the operation of certification bodies that are accredited by the national accreditation body and by informing the voluntary schemes about relevant observations.

(109) In order to avoid a disproportionate administrative burden, a list of default values should be laid down for common biofuel , bioliquid and biomass fuel production pathways and that list should be updated and expanded when further reliable data is available. Economic operators should always be entitled to claim the level of greenhouse gas emission saving for biofuels, bioliquids and biomass fuels established by that list. Where the default value for greenhouse gas emission saving from a production pathway lies below the required minimum level of greenhouse gas emission saving, producers wishing to demonstrate their compliance with this minimum level should be required to show that actual emissions from their production process are lower than those that were assumed in the calculation of the default values.

(110) It is necessary to lay down clear rules ***based on objective and non-discriminatory criteria,*** for the calculation of greenhouse gas emission savings from biofuels, bioliquids and biomass fuels and their fossil fuel comparators.

(111) In accordance with the current technical and scientific knowledge, the greenhouse gas accounting methodology should take into account the transformation of the solid and gaseous biomass fuels into final energy in order to be consistent with the calculation of renewable energy for the purposes of counting towards the Union target laid down in this Directive. The allocation of emissions to co-products, as distinct from wastes and residues, should also be reviewed in cases where electricity and/or heating and cooling are produced in co-generation or multi-generation plants.

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(112) If land with high stocks of carbon in its soil or vegetation is converted for the cultivation of raw materials for biofuels, bioliquids and biomass fuels, some of the stored carbon will generally be released into the atmosphere, leading to the formation of carbon dioxide. The resulting negative greenhouse gas impact can offset the positive greenhouse gas impact of the biofuels, bioliquids or biomass fuels, in some cases by a wide margin. The full carbon effects of such conversion should therefore be taken into account in calculating the greenhouse gas emission saving of particular biofuels, bioliquids and biomass fuels. This is necessary to ensure that the greenhouse gas emission saving calculation takes into account the totality of the carbon effects of the use of biofuels, bioliquids and biomass fuels.

(113) In calculating the greenhouse gas impact of land conversion, economic operators should be able to use actual values for the carbon stocks associated with the reference land use and the land use after conversion. They should also be able to use standard values. The methodology of the Intergovernmental Panel on Climate Change is the appropriate basis for such standard values. That work is not currently expressed in a form that is immediately applicable by economic operators. The Commission should therefore revise the guidelines of 10 June 2010 for the calculation of land carbon stocks for the purpose of Annex V to this Directive, while ensuring coherence with Regulation (EU) No 525/2013 of the European Parliament and of the Council▌ .

(114) Co-products from the production and use of fuels should be taken into account in the calculation of greenhouse gas emissions. The substitution method is appropriate for the purposes of policy analysis, but not for the regulation of individual economic operators and individual consignments of transport fuels. In those cases the energy allocation method is the most appropriate method, as it is easy to apply, is predictable over time, minimises counter-productive incentives and produces results that are generally comparable with those produced by the substitution method. For the purposes of policy analysis the Commission should also, in its reporting, present results using the substitution method.

(115) Co-products are different from residues and agricultural residues, as they are the primary aim of the production process. It is therefore appropriate to clarify that agricultural crop residues are residues and not co-products. This has no implications on the existing methodology but clarifies the existing provisions.

(116) The established method of using energy allocation as a rule for dividing greenhouse gas emissions between co-products has worked well and should be continued. It is appropriate to align the methodology for calculating greenhouse gas emissions coming from the use of cogeneration of heat and electricity (CHP) when the CHP is used in processing biofuels, bioliquids and biomass fuels to the methodology applied to a CHP being the end use.

(117) The methodology takes into account the reduced greenhouse gas emissions arising from the use of CHP, compared to the use of electricity- and heat-only plants, by taking into account the utility of heat compared to electricity, and the utility of heat at different temperatures. It follows that higher temperature should bear a larger part of the total greenhouse gas emissions, than heat at low temperature, when the heat is co-produced with electricity. The methodology takes into account the whole pathway to final energy, including conversion to heat or electricity.

(118) It is appropriate for the data used in the calculation of the default values to be obtained from independent, scientifically expert sources and to be updated as appropriate as those sources progress their work. The Commission should encourage those sources to address, when they update their work, emissions from cultivation, the effect of regional and climatological conditions, the effects of cultivation using sustainable agricultural and organic farming methods, and the scientific contribution of producers, within the Union and in third countries, and civil society.

(119) Global demand for agricultural commodities is growing. Part of that increased demand will be met through an increase in the amount of land devoted to agriculture. The restoration of land that has been severely degraded and therefore cannot be used, in its present state, for agricultural purposes is a way of increasing the amount of land available for cultivation. The sustainability scheme should promote the use of restored degraded land because the promotion of biofuels, bioliquids and biomass fuels will contribute to the growth in demand for agricultural commodities.

(120) In order to ensure a harmonised implementation of the greenhouse gas emissions calculation methodology and to align to the latest scientific evidence the Commission should be empowered to adapt the methodological principles and values necessary for assessing whether greenhouse gas emissions savings criteria have been fulfilled and to decide that reports submitted by Member States and third countries contain accurate data on cultivation emissions of feedstock.

(121) European gas grids are becoming more integrated. The promotion of the production and use of biomethane, its injection into natural gas grid and cross-border trade create a need to ensure proper accounting of renewable energy as well as avoiding double incentives resulting from different support schemes in various Member States. The mass balance system related to verification of bioenergy sustainability and the new European database should contribute to address these issues.

(122) The achievement of the objectives of this Directive requires that the Union and Member States dedicate a significant amount of financial resources to research and development in relation to renewable energy technologies. In particular, the European Institute of Innovation and Technology should give high priority to the research and development of renewable energy technologies.

(123) The implementation of this Directive should reflect, where relevant, the provisions of the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, in particular as implemented through Directive 2003/4/EC of the European Parliament and of the Council[1].

[1] Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC (OJ L 41, 14.2.2003, p. 26).

(124) In order to amend or supplement non-essential elements of the provisions of this Directive, the power to adopt acts in accordance with Article 290 of the Treaty on the Functioning of the European Union should be delegated to the Commission in respect of the ***methodology for calculating the quantity of renewable energy used for cooling and district cooling and to revise Annex VII, the establishment of the ERDP and setting the conditions of finalising transactions of statistical transfer between member states, the appropriate minimum threshold for greenhouse gas emission savings of recycled carbon fuels, the adoption of criteria, and if appropriate their revision, for certification of low indirect land-use change-risk biofuels, bioliquids and biomass fuels and for determining the high indirect land-use change risk feedstocks for which significant expansion of the production are into land with high carbon stock is observed and the gradual decrease in their contribution to the targets set out in articles 3(1) and 25 (1), the European methodology for setting the rules for economic operators to comply with the requirements to consider electricity as fully renewable when producing renewable liquids and gaseous transport fuels of non-biological origin, the*** list of feedstocks for the production of advanced biofuels, the contribution of which towards the fuel suppliers' obligation in transport is limited; the adaptation of the energy content of transport fuels to scientific and technical progress; the methodology to determine the share of biofuel resulting from biomass being processed with fossil fuels in a common process; the ***methodology for assessing the greenhouse gas emission from renewable liquid and gaseous transport fuels of non biological origin and recycled carbon fuels,*** and the rules for calculating the greenhouse gas impact of biofuels, bioliquids and their fossil fuel comparators. It is of particular importance that the Commission carry out appropriate consultations during its preparatory work, including at expert level, and that those consultations be conducted in accordance with the principles laid down in the Interinstitutional Agreement of 13 April 2016 on Better Law-Making. In particular, to ensure equal participation in the preparation of delegated acts, the European Parliament and the Council receive all documents at the same time as Member States' experts, and their experts systematically have access to meetings of Commission expert groups dealing with the preparation of delegated acts.

(125) The measures necessary for the implementation of this Directive should be adopted in accordance with Regulation (EU) No 182/2011 of the European Parliament and of the Council[1]**.**

(126) Since the objectives of this Directive, namely to achieve at least ***32*** % share of energy from renewable sources in the Union's gross final consumption of energy by 2030, cannot be sufficiently achieved by the Member States but can rather , by reason of the scale of the action, be better achieved at Union level, the Union may adopt measures, in accordance with the principle of subsidiarity as set out in Article 5 of the Treaty on European Union . In accordance with the principle of proportionality, as set out in that Article, this Directive does not go beyond what is necessary in order to achieve those objectives.

(127) The obligation to transpose this Directive into national law should be confined to those provisions which represent a substantive amendment as compared to the earlier Directive. The obligation to transpose provisions which are unchanged arises under the earlier Directive.

[1] Regulation (EU) No 182/2011 of the European Parliament and of the Council of 16 February 2011 laying down the rules and general principles concerning mechanisms for control by Member States of the Commission's exercise of implementing powers (OJ L 55, 28.2.2011, p.13).

(128) In accordance with the Joint Political Declaration of Member States and the Commission on explanatory documents of 28 September 2011[1] , Member States have undertaken to accompany, in justified cases, the notification of their transposition measures with one or more documents explaining the relationship between the components of a directive and the corresponding parts of national transposition instruments.

(129) This Directive should be without prejudice to the obligations of the Member States relating to the time-limit for the transposition into national law of the Directives set out in part B of Annex XI,

HAVE ADOPTED THIS DIRECTIVE:

▌

[1] OJ C 369, 17.12.2011, p. 14.

Article 1

Subject-matter

This Directive establishes a common framework for the promotion of energy from renewable sources. It sets a binding Union target for the overall share of energy from renewable sources in gross final consumption of energy in 2030. It also lays down rules on financial support to electricity produced from renewable sources, self-consumption of renewable electricity, and renewable energy use in the heating and cooling and transport sectors, regional cooperation between Member States and with third countries, guarantees of origin, administrative procedures and information and training. It establishes sustainability and greenhouse gas emissions saving criteria for biofuels, bioliquids and biomass fuels.

Article 2

Definitions

For the purposes of this Directive, the definitions in Directive 2009/72/EC of the European Parliament and of the Council[1] apply.

The following definitions also apply:

(a) ‘energy from renewable sources’ means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and , geothermal energy , ambient ***energy***, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases;

[1] Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC (OJ L 211, 14.8.2009, p. 55).

(b) ***'ambient energy' means naturally occurring thermal energy and energy accumulated in the environment with constrained boundaries, which can be stored in the ambient air excluding exhaust air or in surface water or in sewage water;***

(***c)*** ***'geothermal energy***' means ***energy stored in the form of heat*** beneath the surface of solid earth ▌;

(d) 'biomass' means the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin;

(e) 'gross final consumption of energy' means the energy commodities delivered for energy purposes to industry, transport, households, services including public services, agriculture, forestry and fisheries, including the consumption of electricity and heat by the energy branch for electricity***, heat*** and ***transport fuel*** production and including losses of electricity and heat in distribution and transmission;

(f) 'district heating' or 'district cooling' means the distribution of thermal energy in the form of steam, hot water or chilled liquids, from ▌ central ***or decentralised sources*** of production through a network to multiple buildings or sites, for the use of space or process heating or cooling;

(g) 'bioliquids' means liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass;

(h) 'biofuels' means liquid fuel for transport produced from biomass;

(i) **'**guarantee of origin**'** means an electronic document which has the sole function of providing proof to a final customer that a given share or quantity of energy was produced from renewable sources;

(j) ‘support scheme’ means any instrument, scheme or mechanism applied by a Member State or a group of Member States, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased. This includes, but is not restricted to, investment aid, tax exemptions or reductions, tax refunds, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and ***sliding and fixed*** premium payments;

(k) ‘renewable energy obligation’ means a support scheme requiring energy producers to include a given proportion of energy from renewable sources in their production, requiring energy suppliers to include a given proportion of energy from renewable sources in their supply, or requiring energy consumers to include a given proportion of energy from renewable sources in their consumption. This includes schemes under which such requirements may be fulfilled by using green certificates;

(l) ‘actual value’ means the greenhouse gas emission saving for some or all of the steps of a specific biofuel production process calculated in accordance with the methodology laid down in part C of Annex V;

(m) ‘typical value’ means an estimate of the greenhouse gas emissions and emission saving for a particular biofuel , bioliquid or biomass fuel production pathway , which is representative of the Union consumption;

(n) ‘default value’ means a value derived from a typical value by the application of pre-determined factors and that may, in circumstances specified in this Directive, be used in place of an actual value;

(o) ‘waste’ shall be defined as in Article 3(1) of Directive 2008/98/EC ; substances that have been intentionally modified or contaminated to meet that definition are not covered by this definition;

(p) ‘starch-rich crops’ means crops comprising mainly cereals (regardless of whether only the grains are used, or the whole plant, such as in the case of green maize, is used), tubers and root crops (such as potatoes, Jerusalem artichokes, sweet potatoes, cassava and yams), and corm crops (such as taro and cocoyam);

(q) ‘ligno-cellulosic material’ means material composed of lignin, cellulose and hemicellulose such as biomass sourced from forests, woody energy crops and forest-based industries' residues and wastes;

(r) ‘non-food cellulosic material’ means feedstocks mainly composed of cellulose and hemicellulose, and having a lower lignin content than ligno-cellulosic material; it includes food and feed crop residues (such as straw, stover, husks and shells), grassy energy crops with a low starch content (such as ryegrass, switchgrass, miscanthus, giant cane ▌ ***),*** cover crops before and after main crops ▌ ***, ley crops***, industrial residues (including from food and feed crops after vegetal oils, sugars, starches and protein have been extracted), and material from biowaste***. Ley and cover crops have to be understood as temporary, short-term sown pastures comprising grass-legume mixture with a low starch content to get fodder for livestock and improve soil fertility for obtaining higher yields of arable main crops***;

(s) ‘residue’ means a substance that is not the end product(s) that a production process directly seeks to produce; it is not a primary aim of the production process and the process has not been deliberately modified to produce it;

(t) ‘renewable liquid and gaseous transport fuels of non-biological origin’ means liquid or gaseous fuels ***which are used in transport*** other than biofuels whose energy content comes from renewable energy sources other than biomass ▌ ;

(u) ‘agricultural, aquaculture, fisheries and forestry residues’ means residues that are directly generated by agriculture, aquaculture, fisheries and forestry; they do not include residues from related industries or processing;

(v) ‘low indirect land-use change-risk biofuels and bioliquids’ means biofuels and bioliquids, the feedstocks of which were produced within schemes which ***avoid*** displacement ***effects of food and feed crop based biofuels, bioliquids and biomass fuels through improved agricultural practices, as well as the cultivation of crops on areas which were previously not used for cultivation of crops*** and which were produced in accordance with the sustainability criteria for biofuels and bioliquids set out in Article 26***;***

(w) ‘distribution system operator’ means an operator as defined in Article 2(6) of Directive 2009/72/EC;

(x) ‘waste heat or cold’ means ***unavoidable*** heat or cold which is generated as by-product in industrial or power generation installations***, or in tertiary sector,*** which would be dissipated unused in air or water without access to a district heating or cooling system***, where cogeneration process has been used or will be used or where cogeneration is not feasible***;

(y) ‘repowering’ means renewing power plants producing renewable energy, including the full or partial replacement of installations or operation systems and equipment, in order to replace capacity or ***to*** increase efficiency ***or capacity of the installation***;

(z) ‘renewable self-consumer’ means ***a final customer operating within its premises located within confined boundaries or where allowed by Member States, on other premises, who generates renewable electricity for its own consumption, and may store and sell self-generated renewable electricity***, provided that, for non-household renewable self-consumers, those activities do not constitute their primary commercial or professional activity;

(aa) ***'jointly acting renewable self-consumers' means a group of jointly acting renewable self-consumers according to definition (aa) who are located in the same building or multi-apartment block;***

(***bb)*** ***'renewable energy community' means a legal entity:***

i) ***which, according to applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects owned and developed by that community;***

ii) ***whose shareholders or members are natural persons, local authorities, including municipalities, or SMEs;***

iii) ***whose primary purpose is to provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits;***

(cc) '***renewables*** power purchase agreement' means a contract under which a legal ***or natural*** person agrees to purchase renewable electricity directly from an energy generator***;***

(dd***)*** ***'peer-to-peer trading' of renewable energy means the sale of renewable energy between market participants by means of a contract with pre-determined conditions governing the automated execution and settlement of the transaction directly between participants or indirectly through a certified third party market participant, such as an aggregator. The right to conduct peer-to-peer trading shall be without prejudice to the rights and obligations of the parties involved as final customers, generators, suppliers or aggregators;***

(ee) ‘food and feed crops’ means starch-rich crops, sugars and oil crops produced on agricultural land as a main crop excluding residues, waste or ligno-cellulosic material***. Intermediate crops such as catch crops and cover crops are not considered main crops provided that their use does not trigger demand for additional land;***

(ff) ‘advanced biofuels’ means biofuels that are produced from feedstocks listed in part A of Annex IX;

(gg) ***‘recycled carbon*** fuels’ means liquid and gaseous fuels ***that are*** produced from ***liquid or solid*** waste streams of non-renewable origin ***which are not suited for material recovery in line with Article 4 of Directive 2008/98/EC and*** waste processing gases and exhaust gases ***of non-renewable origin which are produced as an unavoidable and not intentional consequence of the production process in industrial installations***;

(hh) ‘fuel supplier’ means the entity supplying fuel to the market ***that is*** responsible for passing fuel ▌through an excise duty point or, ***in case of electricity or*** where no excise is due ***or when it is duly justified***, any other relevant entity designated by a Member State;

(ii) ‘agricultural biomass’ means biomass produced from agriculture;

(jj) ‘forest biomass’ means biomass produced from forestry;

▌

(kk) ‘SME’ means a micro, small or medium sized enterprise as defined in Commission Recommendation 2003/361/EC[1];

(ll) ‘forest regeneration’ means the re-establishment of a forest stand by natural or artificial means following the removal of the previous stand by felling or as a result of natural causes, including fire or storm;

[1] Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (OJ L 124, 20.5.2003, p. 36).

(mm) ‘forest holding’ means one or more parcels of forest and other wooded land which constitute a single unit from the point of view of management or utilisation;

(nn) ***‘biowaste’ means biowaste as defined in Article 3(4) of Directive 2008/98/EC;***

(oo) ‘residual energy mix’ means the total annual energy mix for a Member State, excluding the share covered by the cancelled guarantees of origin;

(pp) ‘biomass fuels’ means gaseous and solid fuels produced from biomass;

(qq) ‘biogas’ means gaseous fuels produced from biomass;

(rr) ‘opened tender’ means a tender procedure for the installation of renewable energy plants organised by a Member State and opened for bids from projects located in one or several other Member States;

(ss) ‘joint tender’ means a tender procedure for the installation of renewable energy plants jointly designed and organised by two or more Member States, that is open to projects located in all Member States involved;

(tt) ‘opened certificate scheme’ means a certificate scheme implemented by a Member State, that is open to installations located in one or several other Member States;

(uu) ‘financial instruments’ means financial instruments as defined in Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council[1];

[1] Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (OJ L 298, 26.10.2012, p. 1).

(vv) ***'sourcing area' means the geographically defined area from which the forest biomass feedstock is sourced, from which reliable and independent information is available and where conditions are sufficiently homogeneous to evaluate the risk of the sustainability and legality characteristics of the forest biomass.***

Article 3

Union binding overall target for 2030

1. Member States shall collectively ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least ***32 %. The Commission shall assess this target, with a view to submit a legislative proposal by 2023 to review it upwards where there are further substantial costs reductions in renewable energy production, or where needed to meet the Union's international commitments for decarbonisation or where a significant decrease in energy consumption in the Union justifies it***.

2. Member States ***shall set national*** contributions to ***collectively meet*** this overall 2030 target ▌ as part of their Integrated National Energy and Climate Plans in accordance with Articles 3 to 5 and Articles 9 to ***13 of Regulation ... of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD)]. In preparing the drafts of these plans, Member States may consider the formula in Annex Ia of Regulation ... of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD)***].

If, on the basis of the assessment of the draft integrated national energy and climate plans submitted pursuant to Article 9 of Regulation ... of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD)], the Commission concludes that Member States' contributions are insufficient for the collective achievement of the Union's binding overall target, it shall follow the process pursuant to Articles 9 and 27(1) of Regulation ... of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD)].

3. Member States shall ensure that their national policies including obligations deriving from Article 25 of this Directive and support schemes, are designed with due regard to the waste hierarchy, as set out in Article 4 of Directive 2008/98/EC, to aim to avoid undue distortive effects on the raw material markets. Member States shall grant no support for renewable energy produced from the incineration of waste, if the separate collection obligations set out in Directive 2008/98/EC have not been complied with.

4. From 1 January 2021 onwards, the share of energy from renewable sources in each Member State's gross final consumption of energy shall not be lower than that shown in the third column of the table in part A of Annex I. Member States shall take the necessary measures to ensure compliance with ***the baseline. If a Member State does not maintain its baseline share as measured over a one-year period, the first and second subparagraphs of Article 27(4bis) of Regulation [Governance] shall apply.***

5. The Commission shall support the high ambition of Member States through an enabling framework comprising the enhanced use of Union funds ***including additional funds to facilitate a just transition of carbon intensive regions towards increased shares of renewable energy***, in particular financial instruments, especially ***for the following purposes:***

(a) ***Reducing*** the cost of capital for renewable energy projects;

▌

(b) ***projects and programs for integration of renewable sources into energy system, increasing flexibility of the energy system, maintaining grid stability and managing grid congestions;***

(c) ***The development of transmission and distribution grid infrastructure, intelligent networks, storage facilities and interconnections, with the objective of arriving at a 15 % electricity interconnection target by 2030, to increase the technically and economically affordable level of renewables in the electricity system;***

(d) ***Enhanced regional cooperation between Member States and between Member States and third countries, through joint projects, joint support schemes and the opening of support schemes for renewable electricity to generators located in other Member States.***

6. ***The Commission shall support Member States who choose to contribute to the Union binding overall target using cooperation mechanisms by establishing a facilitative platform.***

Article 4

Financial support for electricity from renewable sources

1. ***In*** order to reach ***or exceed*** the Union target set in Article 3(1)***, and Member State's respective contributions to this target set at a national level for the deployment of renewable energy***, Member States may apply support schemes. Support schemes for electricity from renewable sources shall ***incentivise integration of electricity from renewable energy sources in the electricity market in a market-based and market-responsive way, avoiding*** unnecessary distortions of electricity markets ***as well as taking*** into account ▌possible ***system integration costs and*** grid ***stability***.

2. Support for electricity from renewable sources shall be designed so as to ***maximise the integration of*** electricity from renewable sources in the electricity market and ensure that renewable energy producers are responding to market price signals and maximise their market revenues.

To this end, in direct price support schemes support shall be granted in the form of a market premium, which could be, inter alia, sliding or fixed.

Member States may provide exemptions to this paragraph for supporting small-scale installations and demonstration projects, without prejudice to applicable Union internal market legislation.

3. Member States shall ensure that support for renewable electricity is granted in an open, transparent, competitive, non-discriminatory and cost-effective manner.

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Member States may provide exemptions from tendering for small-scale installations and demonstration projects.

Member States may also consider mechanisms to ensure the regional diversification of renewables deployment particularly to ensure cost-efficient system integration.

4. Member States may limit tendering to specific technologies where opening support to all generators would lead to a suboptimal result, in view of:

(a) the long-term potential of a particular technology;

(b) the need to achieve diversification;

(c) grid integration costs;

(d) network constraints and grid stability;

(e) for biomass, avoiding distortions on the raw material markets.

5. Where support for renewable energy is granted by means of tendering, in order to ensure a high project realisation rate, Member States shall:

(a) establish and publish non-discriminatory and transparent criteria to qualify for the tendering and set clear dates and rules for the delivery of the project;

(b) publish information about past tendering including project realisation rates.

6. In order to increase the generation of energy from renewable sources in the outermost regions and small islands, Member States may adapt financial support for projects located in those regions in order to take into account the production costs associated with their specific conditions of isolation and external dependence.

7. By ... [2021] and every three years thereafter, the Commission shall report to the European Parliament and to the Council on the performance of support granted by means of tendering procedures in the Union, analysing, in particular the ability of tendering to:

(a) achieve cost-reduction;

(b) achieve technological improvement;

(c) achieve high realisation rates;

(d) provide non-discriminatory participation of small actors and local authorities, where applicable;

(e) limit environmental impact;

(f) ensure local acceptability;

(g) ensure security of supply and grid integration.

8. This article shall apply without prejudice to Articles 107 and 108 of the Treaty on the Functioning of the European Union.

Article 5

Opening of support schemes for renewable electricity

1. ***Member States shall have the right to decide, in accordance with Articles 7 to 13 of this Directive, to which extent they support energy from renewable sources which is produced in a different Member State. However, Member States may*** open support for electricity generated from renewable sources to generators located in other Member States under the conditions laid down in this Article.

▌

When opening support Member States may provide that support for a share of the newly-supported capacity, or of the budget allocated thereto, in each year is open to installations located in other Member States.

Such indicative shares may be, in each year, at least 5 % between 2023 and 2026 and at least 10 % between 2027 and 2030, or the level of interconnectivity of a Member State in any given year, if lower.

Member States may organize one or several pilot schemes where support is open to generators located in other Member States in order to acquire further implementation experience.

2. Member States may ask for the proof of physical import. For this purpose, Member States may limit their support to installations in Member States to which there is a direct connection via interconnectors. However, they shall not change, alter or otherwise impact cross-zonal schedules and capacity allocation due to generators participating in cross-border support schemes. Cross-border electricity transfers shall be determined solely by the outcome of capacity allocation pursuant to [Article 14 of the Electricity Market Regulation].

3. ***If a Member State decides to open support to generators located in other Member States, those participating Member States shall agree on the principles of participating in the*** cross-border ***support schemes for renewable energy. Such agreements shall cover at least the principles of*** allocation of renewable electricity ***that is*** benefiting from ***crossborder*** support ▌**.**

4. ***The Commission, upon request of the Member States concerned, shall assist Member States throughout the negotiation process and the setting up of the cooperation arrangements by providing information and analysis, including quantitative and qualitative data on direct and indirect cost and benefits of cooperation, as well as guidance and technical expertise throughout the process. The Commission may encourage or facilitate the exchange of best practice and develop templates for cooperation agreements facilitating the process***. The Commission shall assess by 2025 the ***costs and*** benefits on the ▌ deployment of renewable electricity in the Union of provisions set out in this Article. ▌

5. ***By 2023, the Commission shall carry out an evaluation of the implementation of this Article. This evaluation shall assess the need to introduce an obligation for Member States to partially open their support schemes to renewable electricity produced in other Member States with a view to have a 5 % opening by 2025 and a 10 % by 2030.***

Article 6

Stability of financial support

1. Without prejudice to adaptations necessary to comply with ***Articles 107 and 108 of the Treaty on the Functioning of the European Union***, Member States shall ensure that the level of, and the conditions attached to, the support granted to renewable energy projects are not revised in a way that negatively impacts the rights conferred thereunder and ***undermines*** the ***economic viability of already*** supported projects**.**

2. Member States shall be able to adjust the level of support according to objective criteria, provided that such criteria are established in the original design of the support scheme.

3. Member States shall publish a long-term schedule anticipating the expected allocation of support, covering at least the next five years, or three years in case of budgetary planning constraints, as a reference and including the indicative timing, including frequency of tendering where appropriate, the expected capacity and budget or maximum unitary support expected to be allocated and the expected eligible technologies, if applicable. This schedule shall be updated on an annual basis or when necessary to reflect recent market developments or expected allocation of support.

4. Member States shall assess the effectiveness of their support for electricity from renewable sources and its major distributive effects on different consumer groups, and on investments at least every five years. That assessment shall take into account the effect of possible changes to the support schemes. The indicative long-term planning governing the decisions of the support and design of new support shall take into account the results of this assessment. Member States shall include the assessment in the relevant progress reports and updates of their national energy and climate plans in compliance with the Regulation ... of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD)].

Article 7

Calculation of the share of energy from renewable sources

1. The gross final consumption of energy from renewable sources in each Member State shall be calculated as the sum of:

(a) gross final consumption of electricity from renewable energy sources;

(b) gross final consumption of energy from renewable sources for heating and cooling; and

(c) final consumption of energy from renewable sources in transport.

Gas, electricity and hydrogen from renewable energy sources shall be considered only once in point (a), (b), or (c) of the first subparagraph, for calculating the share of gross final consumption of energy from renewable sources.

Subject to the second subparagraph of Article 26 (1), biofuels, bioliquids and biomass fuels that do not fulfil the sustainability and greenhouse gas emissions saving criteria set out in Article 26(2) to (7) shall not be taken into account.

▌

2. For the purposes of paragraph 1(a), gross final consumption of electricity from renewable energy sources shall be calculated as the quantity of electricity produced in a Member State from renewable energy sources, including the production of electricity from renewable self-consumers and energy communities and excluding the production of electricity in pumped storage units from water that has previously been pumped uphill.

In multi-fuel plants using renewable and conventional sources, only the part of electricity produced from renewable energy sources shall be taken into account. For the purposes of this calculation, the contribution of each energy source shall be calculated on the basis of its energy content.

The electricity generated by hydropower and wind power shall be accounted for in accordance with the normalisation rules set out in Annex II.

3. For the purposes of paragraph 1(b), the gross final consumption of energy from renewable sources for heating and cooling shall be calculated as the quantity of district heating and cooling produced in a Member State from renewable sources, plus the consumption of other energy from renewable sources in industry, households, services, agriculture, forestry and fisheries, for heating, cooling and processing purposes.

In multi-fuel plants using renewable and conventional sources, only the part of heating and cooling produced from renewable energy sources shall be taken into account. For the purposes of this calculation, the contribution of each energy source shall be calculated on the basis of its energy content.

Ambient ***and geothermal*** energy ***used for heating and cooling by means of*** heat pumps ***and district cooling systems*** shall be taken into account for the purposes of paragraph 1(b) provided that the final energy output significantly exceeds the primary energy input required to drive the heat pumps. The quantity of heat ***or cold*** to be considered as energy from renewable sources for the purposes of this Directive shall be calculated in accordance with the methodology laid down in Annex VII ***and shall take into account energy use in all end-use sectors***.

Thermal energy generated by passive energy systems, under which lower energy consumption is achieved passively through building design or from heat generated by energy from non-renewable sources, shall not be taken into account for the purposes of paragraph 1(b).

By 31 December 2021 at the latest, the Commission shall adopt delegated acts in accordance with Article 32, establishing a methodology for calculating the quantity of renewable energy used for cooling and district cooling and to revise Annex VII on calculation of energy from heat pumps.

This methodology shall include minimum seasonal performance factors for heat pumps operating in reverse mode.

4. For the purposes of paragraph 1(c), the following provisions shall apply:

(a) The gross final consumption of energy from renewable sources in transport shall be calculated as the sum of all biofuels, biomass fuels and renewable liquid and gaseous transport fuels of non-biological origin consumed in the transport sector. However, renewable liquid and gaseous transport fuels of non-biological origin that are produced from renewable electricity shall only be considered to be part of the calculation pursuant to paragraph 1(a) when calculating the quantity of electricity produced in a Member State from renewable energy sources;

(b) For the calculation of gross final consumption of energy in transport the values regarding the energy content of transport fuels, as set out in Annex III, shall be used. For the determination of the energy content of transport fuels not included in Annex III, the Member States shall use the respective ESOs standards for determination of calorific values of fuels. Where no ESOs standard has been adopted for this purpose, the respective ISO standards shall be used.

5. The share of energy from renewable sources shall be calculated as the gross final consumption of energy from renewable sources divided by the gross final consumption of energy from all energy sources, expressed as a percentage.

For the purposes of the first subparagraph, the sum referred to in paragraph 1 shall be adjusted in accordance with Articles 8, 10, 12 and 13.

In calculating a Member State's gross final energy consumption for the purpose of measuring its compliance with the targets and indicative trajectory laid down in this Directive, the amount of energy consumed in aviation shall, as a proportion of that Member State's gross final consumption of energy, be considered to be no more than 6,18 %. For Cyprus and Malta the amount of energy consumed in aviation shall, as a proportion of those Member States' gross final consumption of energy, be considered to be no more than 4,12 %.

6. The methodology and definitions used in the calculation of the share of energy from renewable sources shall be those of Regulation (EC) No 1099/2008.

Member States shall ensure coherence of statistical information used in calculating those sectoral and overall shares and statistical information reported to the Commission under Regulation (EC) No 1099/2008.

Article 8

European Union Renewable Development Platform and statistical transfers between Member States

1. Member States may agree on the statistical transfer of a specified amount of energy from renewable sources from one Member State to another Member State. The transferred quantity shall be:

   (a) deducted from the amount of energy from renewable sources that is taken into account in measuring the renewable energy share of the Member State making the transfer for the purposes of this Directive; and

   (b) added to the amount of energy from renewable sources that is taken into account in measuring the renewable energy share of ***the*** Member State accepting the transfer for the purposes of this Directive.

2. In order to facilitate the achievement of the Union binding target, Member States' respective contributions to this target as set out in Article 3 of this Directive and statistical transfers in accordance with paragraph 1 of this Article, the Commission shall establish a European Union Renewable Development Platform ("ERDP"). Member States may submit to this platform on a voluntary basis yearly data on their contributions to the EU binding target for 2030 or any benchmark set for monitoring the progress in Regulation [Governance], including the expected shortfall or overachievement thereof, and an indication of price on which they would accept to transfer any excess production of energy from renewable sources from or to another Member State. The actual price of these transfers will be set on a case by case basis based on the ERDP demand and offer matching mechanism.

3. ***The Commission shall ensure that the ERDP is able to match the demand and offer for amounts of energy from renewable energy sources that is taken into account in measuring the renewable energy share of Member State based on prices or any other additional criteria specified by the Member State that the energy is transferred to.***

The Commission is empowered to adopt delegated acts in accordance with Article 32 for the establishment of the ERDP and setting the conditions of finalising transactions as referred to in paragraph 5 of this Article.

4. The arrangements referred to in paragraph 1 ***and 2*** may have a duration of one or more years. ***Such arrangements between Member States*** shall be notified to the Commission ***or finalised on the ERDP*** not later than 12 months after the end of each year in which they have effect. The information sent to the Commission shall include the quantity and price of the energy involved. ***For transfers finalised on the ERDP, the parties involved and the information on the particular transfer of those transactions shall be disclosed to the public.***

5. Transfers shall become effective ***after clearing conditions are met on the ERDP or*** after all Member States involved in the transfer have notified the transfer to the Commission.

Article 9

Joint projects between Member States

1. Two or more Member States may cooperate on all types of joint projects relating to the production of electricity, heating or cooling from renewable energy sources. That cooperation may involve private operators.

2. Member States shall notify the Commission of the proportion or amount of electricity, heating or cooling from renewable energy sources produced by any joint project in their territory, that became operational after 25 June 2009, or by the increased capacity of an installation that was refurbished after that date, which is to be regarded as counting towards the national overall renewable energy share of another Member State for the purposes of this Directive.

3. The notification referred to in paragraph 2 shall:

   (a) describe the proposed installation or identify the refurbished installation;

   (b) specify the proportion or amount of electricity or heating or cooling produced from the installation which is to be regarded as counting towards the national overall renewable energy share of another Member State;

   (c) identify the Member State in whose favour the notification is being made; and

   (d) specify the period, in whole calendar years, during which the electricity or heating or cooling produced by the installation from renewable energy sources is to be regarded as counting towards the national overall renewable energy share of the other Member State.

4. The duration of a joint project may extend beyond 2030.

5. A notification made under this Article shall not be varied or withdrawn without the joint agreement of the Member State making the notification and the Member State identified in accordance with paragraph 3(c).

6. The Commission shall facilitate the establishment of joint projects between Member States, notably via dedicated technical assistance and project development assistance, upon request by the Member States concerned.

Article 10

Effects of joint projects between Member States

1. Within three months of the end of each year falling within the period specified under Article 9(3)(d), the Member State that made the notification under Article 9 shall issue a letter of notification stating:

   (a) the total amount of electricity or heating or cooling produced during the year from renewable energy sources by the installation which was the subject of the notification under Article 9; and

   (b) the amount of electricity or heating or cooling produced during the year from renewable energy sources by that installation which is to count towards the national overall renewable energy share of another Member State in accordance with the terms of the notification.

2. The notifying Member State shall send the letter of notification to the Member State in whose favour the notification was made and to the Commission.

3. For the purposes of this Directive, the amount of electricity or heating or cooling from renewable energy sources notified in accordance with paragraph 1(b) shall be:

(a) deducted from the amount of electricity or heating or cooling from renewable energy sources that is taken into account, in measuring the renewable energy share of the Member State issuing the letter of notification under paragraph 1; and

(b) added to the amount of electricity or heating or cooling from renewable energy sources that is taken into account in measuring the renewable energy share of the Member State receiving the letter of notification in accordance with paragraph 2.

Article 11

Joint projects between Member States and third countries

1. One or more Member States may cooperate with one or more third countries on all types of joint projects regarding the production of electricity from renewable energy sources. Such cooperation may involve private operators ***and shall take place in full respect of international law***.

2. Electricity from renewable energy sources produced in a third country shall be taken into account only for the purposes of measuring Member States' renewable energy shares if the following conditions are met:

(a) the electricity is consumed in the Union. This**,** requirement is deemed to be met where:

(i) an equivalent amount of electricity to the electricity accounted for has been firmly nominated to the allocated interconnection capacity by all responsible transmission system operators in the country of origin, the country of destination and, if relevant, each third country of transit;

(ii) an equivalent amount of electricity to the electricity accounted for has been firmly registered in the schedule of balance by the responsible transmission system operator on the Union side of an interconnector; and

(iii) the nominated capacity and the production of electricity from renewable energy sources by the installation referred to in paragraph 2(b) refer to the same period of time;

(b) the electricity is produced by a newly constructed installation that became operational after 25 June 2009 or by the increased capacity of an installation that was refurbished after that date, under a joint project as referred to in paragraph 1;

(c) the amount of electricity produced and exported has not received support from a support scheme of a third country other than investment aid granted to the installation; and

(d) the electricity has been produced in accordance with international law, in a third country that is a signatory to the Convention for the Protection of Human Rights and Fundamental Freedoms or other international conventions or Treaties on Human Rights.

3. Member States may apply to the Commission, for the purposes of Article 7, for account to be taken of electricity from renewable energy sources produced and consumed in a third country, in the context of the construction of an interconnector with a very long lead-time between a Member State and a third country if the following conditions are met:

(a) construction of the interconnector started by 31 December 2026;

(b) it is not possible for the interconnector to become operational by 31 December 2030;

(c) it is possible for the interconnector to become operational by 31 December 2032;

(d) after it becomes operational, the interconnector will be used for the export to the Union , in accordance with paragraph 2, of electricity generated from renewable energy sources;

(e) the application relates to a joint project that fulfils the criteria in points (b) and (c) of paragraph 2 and that will use the interconnector after it becomes operational, and to a quantity of electricity that is no greater than the quantity that will be exported to the Union after the interconnector becomes operational.

4. The proportion or amount of electricity produced by any installation in the territory of a third country, which is to be regarded as counting towards the national overall energy share of one or more Member States for the purposes of this Directive , shall be notified to the Commission. When more than one Member State is concerned, the distribution between Member States of this proportion or amount shall be notified to the Commission. This proportion or amount shall not exceed the proportion or amount actually exported to, and consumed in, the Union , corresponding to the amount referred to in paragraph 2(a)(i) and (ii) of this Article and meeting the conditions as set out in its paragraph (2)(a). The notification shall be made by each Member State towards whose overall national target the proportion or amount of electricity is to count.

5. The notification referred to in paragraph 4 shall:

(a) describe the proposed installation or identify the refurbished installation;

(b) specify the proportion or amount of electricity produced from the installation which is to be regarded as counting towards the national renewable energy share of a Member State as well as, subject to confidentiality requirements, the corresponding financial arrangements;

(c) specify the period, in whole calendar years, during which the electricity is to be regarded as counting towards the national overall renewable energy share of the Member State; and

(d) include a written acknowledgement of points (b) and (c) by the third country in whose territory the installation is to become operational and the proportion or amount of electricity produced by the installation which will be used domestically by that third country.

6. The duration of a joint project may extend beyond 2030.

7. A notification made under this Article may not be varied or withdrawn without the joint agreement of the Member State making the notification and the third country that has acknowledged the joint project in accordance with paragraph 5(d).

8. Member States and the Union shall encourage the relevant bodies of the Energy Community Treaty to take, in conformity with the Energy Community Treaty, the measures which are necessary so that the Contracting Parties to that Treaty can apply the provisions on cooperation laid down in this Directive between Member States.

Article 12

Effects of joint projects between Member States and third countries

1. Within 12 months of the end of each year falling within the period specified under Article 11 (5)(c), the Member State having made the notification under Article 11 shall issue a letter of notification stating:

   (a) the total amount of electricity produced during that year from renewable energy sources by the installation which was the subject of the notification under Article 11;

   (b) the amount of electricity produced during the year from renewable energy sources by that installation which is to count towards its national overall renewable energy share in accordance with the terms of the notification under Article 11; and

   (c) proof of compliance with the conditions set out in Article 11 (2).

2. The Member State shall send the letter of notification to the third country which has acknowledged the project in accordance with Article 11 (5)(d) and to the Commission.

3. For the purposes of calculating the national overall renewable energy shares under this Directive, the amount of electricity produced from renewable energy sources notified in accordance with paragraph 1(b) shall be added to the amount of energy from renewable sources that is taken into account, in measuring the renewable energy shares of the Member State issuing the letter of notification.

Article 13

Joint support schemes

1. Without prejudice to the obligations of Member States under Article 5, two or more Member States may decide, on a voluntary basis, to join or partly coordinate their national support schemes. In such cases, a certain amount of energy from renewable sources produced in the territory of one participating Member State may count towards the national renewable energy share of another participating Member State if the Member States concerned:

   (a) make a statistical transfer of specified amounts of energy from renewable sources from one Member State to another Member State in accordance with Article 8; or

   (b) set up a distribution rule agreed by participating Member States that allocates amounts of energy from renewable sources between the participating Member States. Such a rule shall be notified to the Commission no later than three months after the end of the first year in which it takes effect.

2. Within three months of the end of each year each Member State having made a notification under paragraph 1(b) shall issue a letter of notification stating the total amount of electricity or heating or cooling from renewable energy sources produced during the year which is to be the subject of the distribution rule.

3. For the purposes of calculating the national overall renewable energy shares under this Directive, the amount of electricity or heating or cooling from renewable energy sources notified in accordance with paragraph 2 shall be reallocated between the concerned Member States in accordance with the notified distribution rule.

4. The Commission shall disseminate guidelines and best practices, and, upon request of the Member States concerned, facilitate the establishment of joint support schemes between Member States.

Article 14

Capacity increases

For the purpose of Article 9 (2) and Article 11 (2)(b), units of energy from renewable sources imputable to an increase in the capacity of an installation shall be treated as if they were produced by a separate installation becoming operational at the moment at which the increase of capacity occurred.

Article 15

Administrative procedures, regulations and codes

1. Member States shall ensure that any national rules concerning the authorisation, certification and licensing procedures that are applied to plants and associated transmission and distribution ***networks*** for the production of electricity, heating or cooling from renewable energy sources, and to the process of transformation of biomass into biofuels***, bioliquids and biomass fuels*** or other energy products, ***and to renewable liquids and gaseous transport fuels of non-biological origin*** are proportionate and necessary ***and contribute to the implementation of the 'energy efficiency first' principle***.

   Member States shall, in particular, take the appropriate steps to ensure that:

   (a) administrative procedures are streamlined and expedited at the appropriate administrative level ***and predictable timeframes for the procedures as mentioned in the first subparagraph are established;***

   (b) rules governing authorisation, certification and licensing are objective, transparent, proportionate, do not discriminate between applicants and take fully into account the particularities of individual renewable energy technologies;

(c) administrative charges paid by consumers, planners, architects, builders and equipment and system installers and suppliers are transparent and cost-related; and

(d) simplified and less burdensome authorisation procedures, including through simple notification ▌, are established for decentralised devices**,** for producing ***and storing*** energy from renewable sources.

2. Member States shall clearly define any technical specifications which must be met by renewable energy equipment and systems in order to benefit from support schemes. Where European standards exist, including eco-labels, energy labels and other technical reference systems established by the European standardisation bodies, such technical specifications shall be expressed in terms of those standards. Such technical specifications shall not prescribe where the equipment and systems are to be certified and should not impede the operation of the internal market.

▌

3. Member States shall ensure that their competent authorities at national, regional and local level include provisions for the integration and deployment of renewable energy ***including for renewable self-consumption and renewable energy communities*** and the use of unavoidable waste heat or cold when ***planning, including early spatial*** planning, designing, building and renovating urban infrastructure, industrial***, commercial*** or residential areas and energy infrastructure, including electricity, district heating and cooling, natural gas and alternative fuel networks. ***Member States shall, in particular, encourage local and regional administrative bodies to include heating and cooling from renewable energy sources in the planning of city infrastructure, where appropriate, and consult with the network operators to reflect the impact of energy efficiency and demand response programs as well as specific provisions on renewable self-consumption and renewable energy communities, on the infrastructure development plans of the operators.***

4. Member States shall introduce in their building regulations and codes appropriate measures in order to increase the share of all kinds of energy from renewable sources in the building sector.

In establishing such measures or in their support schemes, Member States may take into account national measures relating to substantial increases***, where applicable, in renewable self-consumption, local energy storage,*** energy efficiency and relating to cogeneration and to passive, low or zero-energy buildings.

Member States shall, in their building regulations and codes or by other means with equivalent effect, require the use of minimum levels of energy from renewable sources in new buildings and in existing buildings that are subject to major renovation ***in so far as this is technically, functionally and economically feasible, and*** reflecting the results of the cost-optimal calculation carried out pursuant to Article 5(2) of Directive ***… of the European Parliament and of the Council [on the energy performance of buildings, 2016/0381(COD)], and does not affect negatively indoor air quality***. Member States shall permit those minimum levels to be fulfilled, inter alia, ***through efficient district heating and cooling*** using a significant proportion of renewable energy sources ***and waste heat and cold***.

The requirements of the first subparagraph shall apply to the armed forces, only to the extent that its application does not cause any conflict with the nature and primary aim of the activities of the armed forces and with the exception of material used exclusively for military purposes.

5. Member States shall ensure that new public buildings, and existing public buildings that are subject to major renovation, at national, regional and local level fulfil an exemplary role in the context of this Directive from 1 January 2012 onwards. Member States may, inter alia, allow that obligation to be fulfilled by ***complying with nearly zero energy building provisions as required in Directive ... of the European Parliament and of the Council [on the energy performance of buildings, 2016/0381(COD)], or by*** providing that the roofs of public or mixed private-public buildings are used by third parties for installations that produce energy from renewable sources.

6. With respect to their building regulations and codes, Member States shall promote the use of renewable energy heating and cooling systems and equipment that achieve a significant reduction of energy consumption. ***To that end*** Member States shall use energy or eco-labels or other appropriate certificates or standards developed at national or Union level, where these exist, ***and ensure the provision of adequate information and advice on renewable, highly energy efficient alternatives as well as eventual financial instruments and incentives available in the case of replacement, in view of promoting an increased replacement rate of old heating systems and an increased switch to renewable energy based solutions that are in accordance with Directive ... of the European Parliament and of the Council [on the energy performance of buildings, 2016/0381(COD)]***.

7. Member States shall carry out an assessment of their potential of renewable energy sources and of the use of waste heat and cold for heating and cooling. That assessment shall***, where appropriate, include spatial analysis of areas suitable for low ecological risk deployment and the potential for small-scale households projects and shall*** be included in the second comprehensive assessment required pursuant to Article 14(1) of Directive 2012/27/EU for the first time by 31 December 2020 and in the updates of the comprehensive assessments thereafter.

8. Member States shall ***assess the regulatory and*** administrative barriers to ▌ long-term ***renewables*** power purchase agreements***, and remove unjustified barriers*** and facilitate ***the*** uptake ***of such agreements. Member States shall ensure that those agreements are not subject to disproportionate or discriminatory procedures and charges.***

Policies and measures facilitating the uptake of power purchase agreements shall be described in the integrated national energy and climate plans and their subsequent progress reports pursuant to Regulation ... of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD)].

Article 16

Organisation and duration of the permit granting process

1. ▌ Member States***,*** shall set up ***or designate*** one or more ▌ contact points ***that, on request by the applicant, shall guide through and facilitate*** the entire ***administrative*** permit ***application and*** granting process ▌***. An applicant shall only have to contact one contact point for the entire administrative process. The permit granting process shall cover relevant administrative*** permits to build***, repower,*** and operate plants and ***assets necessary for their connection to the grid*** for the production of energy from renewable energy sources. ***The permit granting process shall comprise all procedures from the acknowledgment of the receipt of the application to transmitting the outcome of the procedure as referred to in paragraph 2 of this Article.***

2. The ▌ contact point shall guide the applicant through the application process in a transparent manner ***up to the delivery of one or several decisions by the responsible authorities at the end of the process***, provide the applicant with all necessary information ▌ and involve, where appropriate, other ***administrative authorities. Applicants shall be able to submit relevant documents also in digital form***.

3. The ▌contact point ***shall make available*** a manual of procedures for renewable ***energy production*** project developers ***and provide this information also online, addressing distinctly also*** small scale projects and renewable self-consumers projects. ***The online information shall also guide the applicant to the contact point relevant for the applicant's application. If the Member State decides to have more than one contact point the online information shall guide the applicant to the contact point relevant for the applicant's application.***

4. The permit granting process referred to in paragraph 1 shall not exceed a period of two years for procedures applicable to power plants including all relevant competent authorities subject to paragraph 7. However the period of two years, in case of extraordinary circumstances, which should be duly justified, can be extended for one additional year.

5. For installations with an electricity capacity below 150 kW, the permit granting process ***shall not exceed one year. In case of extraordinary circumstances, which should be duly justified, this time limit can be extended for one additional year.***

Member States shall ensure that applicants have access to simple and accessible procedures for the settlements of disputes concerning permit granting processes and the issuance of permit to build and operate renewable energy plants including, where applicable, out of court resolution mechanisms.

6. Member States shall facilitate the repowering of existing renewable energy plants by ▌ ensuring a simplified and swift permit granting process ▌ ***. The length of that process*** shall not exceed one year***.*** ▌

▌

In the case of extraordinary circumstances which should be duly justified, such as for overriding safety reasons where the repowering project impacts substantially on the grid or the installation's original capacity, size or performance, this time limit can be extended for one additional year.

7. The deadlines established in this Article apply without prejudice to obligations under applicable environmental EU legislation, judicial appeals, remedies and other proceedings before a court or tribunal and to non-judicial appeals and remedies and may be extended by the duration of such procedures.

▌

8. Member States may decide to apply simple notification procedures for grid connections as of Article 17(1) to repowering projects. In this case repowering shall be allowed following a notification to ***responsible authority where no significant*** negative environmental or social impact is expected. The ***responsible authority*** shall decide within six months of the receipt of the notification if this is sufficient.

Where the ***responsible authority*** decides that the notification is sufficient, it shall automatically grant the permit. Where the ***responsible authority*** decides that the notification is not sufficient, it shall be necessary to apply for a new permit. In this case the time limits referred to in Article 16(6) apply.

Article ***17***

Simple notification procedures for grid connections

1. ***Member States shall establish a simple notification procedure whereby installations or aggregated production units of renewable self-consumers and demonstration projects with an electrical capacity of equal or less than 10.8 kW, or equivalent for connections other than 3 phase,*** **shall be connected to the grid following** ***a notification to the distribution system operator.***

The distribution system operator may decide to reject or propose an alternative grid connection point on justified grounds of safety concerns or technical incompatibility of the system components within a limited period following the notification. In case of a positive decision by the distribution system operator, or in the absence of a decision by the distribution system operator within one month following the notification, the installation or aggregated production unit may be connected.

2. Member States may allow simple notification procedures for installations or aggregated production units with a higher electrical capacity than set in paragraph 1 of a capacity of up to 50 kW, provided that grid stability, reliability and safety is maintained.

Article 18

Information and training

1. Member States shall ensure that information on support measures is made available to all relevant actors, such as consumers, ***including low-income, vulnerable consumers, renewable self-consumers and renewable energy communities,*** builders, installers, architects, and suppliers of heating, cooling and electricity equipment and systems and ***suppliers*** of vehicles compatible with the use of energy ***and of intelligent transport systems***.

2. Member States shall ensure that information on the net benefits, cost and energy efficiency of equipment and systems for the use of heating, cooling and electricity from renewable energy sources is made available either by the supplier of the equipment or system or by the national competent authorities.

3. Member States shall ensure that certification schemes or equivalent qualification schemes are available for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps. Those schemes may take into account existing schemes and structures as appropriate, and shall be based on the criteria laid down in Annex IV. Each Member State shall recognise certification awarded by other Member States in accordance with those criteria.

4. Member States shall make available to the public information on certification schemes or equivalent qualification schemes as referred to in paragraph 3. Member States may also make available the list of installers who are qualified or certified in accordance with the provisions referred to in paragraph 3.

5. Member States shall ensure that guidance is made available to all relevant actors, notably for planners and architects so that they are able properly to consider the optimal combination of renewable energy sources, of high-efficiency technologies and of district heating and cooling when planning, designing, building and renovating industrial, commercial or residential areas.

6. Member States, ***where appropriate*** with the participation of local and regional authorities, shall develop suitable information, awareness-raising, guidance or training programmes in order to inform citizens ***on how to exercise their rights as active customers, and*** of the benefits and practicalities***, including technical and financial aspects,*** of developing and using energy from renewable sources***, including by self-consumption or in the framework of renewable energy communities***.

Article 19

Guarantees of origin of ▌ renewable energy sources

1. For the purposes of proving to final customers the share or quantity of energy from renewable sources in an energy supplier's energy mix and in the energy supplied to consumers under contracts marketed with reference to the consumption of energy from renewable sources , Member States shall ensure that the origin of energy produced from renewable ▌ sources can be guaranteed as such within the meaning of this Directive, in accordance with objective, transparent and non-discriminatory criteria.

2. To that end, Member States shall ensure that a guarantee of origin is issued in response to a request from a producer of energy from renewable sources***, unless for the purposes of accounting for the market value of the guarantee of origin Member States decide not to issue one to a producer that receives financial support from a support scheme***. Member States may arrange for guarantees of origin to be issued for non-renewable energy sources. Issuance of guarantees of origin may be made subject to a minimum capacity limit. A guarantee of origin shall be of the standard size of 1 MWh. No more than one guarantee of origin shall be issued in respect of each unit of energy produced.

Member States shall ensure that the same unit of energy from renewable sources is taken into account only once.

Member States shall ensure that ***when*** a producer ▌ receives financial support from a support scheme for the ▌ production of energy from renewable sources***, the market value of the guarantee of origin for the same production is appropriately taken into account in the relevant support scheme.***

It shall be presumed that this is the case when:

(a) the financial support is granted by way of a tendering or a tradable green certificate system;

(b) the market value of the guarantees of origin is administratively taken into account in the level of financial support; or

(c) the guarantees of origin are not issued directly to the producer but to a supplier or consumer who buys the renewable energy either in a competitive setting or in a long-term corporate renewables power purchase agreement.

To take into account the market value of the guarantee of origin Member States may, inter alia, decide to issue a guarantee of origin to the producer and cancel it immediately.

The guarantee of origin shall have no function in terms of a Member State's compliance with Article 3. Transfers of guarantees of origin, separately or together with the physical transfer of energy, shall have no effect on the decision of Member States to use statistical transfers, joint projects or joint support schemes for target compliance or on the calculation of the gross final consumption of energy from renewable sources in accordance with Article 7.

3. For the purposes of paragraph 1, guarantees of origin shall be valid ***for twelve*** months after the ***production of the relevant energy unit.*** Member States shall ensure that all guarantees of origin ▌ that have not been cancelled shall expire ***at the latest 18 months after the production of the energy unit***. Expired guarantees of origin shall be included by Member States in the calculation of the residual energy mix.

4. For the purposes of disclosure referred to in paragraphs 8 and 13, Member States shall ensure that guarantees of origin are cancelled by energy companies ***at the latest 6 months after the end of the validity of the guarantee of origin***.

5. Member States or designated competent bodies shall supervise the issuance, transfer and cancellation of guarantees of origin. The designated competent bodies shall have non-overlapping geographical responsibilities, and be independent of production, trade and supply activities.

6. Member States or the designated competent bodies shall put in place appropriate mechanisms to ensure that guarantees of origin shall be issued, transferred and cancelled electronically and are accurate, reliable and fraud-resistant. Member States and designated competent bodies shall ensure that the requirements they impose are compliant with the standard CEN - EN 16325.

7. A guarantee of origin shall specify at least:

(a) the energy source from which the energy was produced and the start and end dates of production;

(b) whether it relates to:

(i) electricity; or

(ii) gas, ***including hydrogen,*** or

(iii) heating or cooling;

(c) the identity, location, type and capacity of the installation where the energy was produced;

(d) whether the installation has benefited from investment support and whether the unit of energy has benefited in any other way from a national support scheme, and the type of support scheme;

(e) the date on which the installation became operational; and

(f) the date and country of issue and a unique identification number.

Simplified information may be specified on guarantees of origin from ▌ installations ***of less than 50 kW***.

8. Where an electricity supplier is required to prove the share or quantity of energy from renewable sources in its energy mix for the purposes of Article 3 of Directive 2009/72/EC, it shall do so by using guarantees of origin ***except for the share of its energy mix corresponding to non-tracked commercial offers, if any, for which the supplier may use the residual mix, or except when Member States decide not to issue guarantees of origin to a producer that receives financial support from a support scheme. Where Member States have arranged to have guarantees of origin for other types of energy, suppliers shall always use for disclosure the same type of guarantees of origin as the energy supplied***. Likewise, guarantees of origin created pursuant to Article 14(10) of Directive 2012/27/EC ***may*** be used to substantiate any requirement to prove the quantity of electricity produced from high-efficiency cogeneration. ***For the purposes of paragraph 2, where*** electricity ***is generated*** from high efficiency cogeneration ***using renewable sources only one guarantee of origin may be issued specifying both characteristics***.

9. Member States shall recognise guarantees of origin issued by other Member States in accordance with this Directive exclusively as proof of the elements referred to in paragraph 1 and paragraph 7 (a) to (f). A Member State may refuse to recognise a guarantee of origin only when it has well-founded doubts about its accuracy, reliability or veracity. The Member State shall notify the Commission of such a refusal and its justification.

10. If the Commission finds that a refusal to recognise a guarantee of origin is unfounded, the Commission may adopt a decision requiring the Member State in question to recognise it.

11. Member States shall not recognise guarantees of origins issued by a third country except where the ***Union*** has ***concluded*** an agreement with that third country on mutual recognition of guarantees of origin issued in the Union and compatible guarantees of origin systems established in that country, ***and only*** where there is direct import or export of energy. ▌

12. A Member State may introduce, in conformity with Union law, objective, transparent and non-discriminatory criteria for the use of guarantees of origin in complying with the obligations laid down in Article 3(9) of Directive 2009/72/EC.

13. ***The Commission shall present a report assessing options to establish an EU-wide green label with a view to promote the use of renewable energy coming from new installations. Suppliers shall*** use ***the information contained in*** guarantees of origin to ***prove compliance with the requirements of such a label.***

Article 20

Access to and operation of the grids

1. Where relevant, Member States shall assess the need to extend existing gas network infrastructure to facilitate the integration of gas from renewable energy sources.

2. Where relevant, Member States shall require transmission system operators and distribution system operators in their territory to publish technical rules in line with Article 6 of Directive 2003/55/EC of the European Parliament and of the Council[1], in particular regarding network connection rules that include gas quality, gas odoration and gas pressure requirements. Member States shall also require transmission and distribution system operators to publish the connection tariffs to connect renewable gas sources based on transparent and non-discriminatory criteria.

[1] Directive 2003/55/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in natural gas and repealing Directive 98/30/EC (OJ L 176, 15.7.2003, p. 57).

3. Subject to their assessment included in the integrated national energy and climate plans in accordance with Annex I of Regulation [Governance], on the necessity to build new infrastructure for district heating and cooling produced from renewable energy sources in order to achieve the Union target referred to in Article 3(1) of this Directive, Member States shall, where relevant, take steps with a view to developing a district heating ***and cooling*** infrastructure to accommodate the development of heating and cooling production from large biomass, solar***, ambient energy*** and geothermal facilities ***and waste heat or cold.***

Article 21

Renewable self-consumers

1. Member States shall ensure that consumers are entitled to become renewable self-consumers, subject to the provisions of this Article.

2. Member States shall ensure that renewable self-consumers, individually or through aggregators ▌***,*** are entitled to ▌***:***

(a) generate renewable energy, including for their own consumption***, store*** and sell ***their excess production of renewable electricity***, including through power purchase agreements, ▌ electricity ***suppliers and peer-to-peer trading arrangements,*** without being subject ▌***:***

(i) in relation to the electricity they consume from or inject into the grid, to discriminatory or disproportionate procedures and ***charges and to network*** charges that are not cost-reflective;

(ii) in relation to their self-generated renewable electricity which remains within their premises, to discriminatory or disproportionate procedures and any charge or fee;

(b) ***install and operate electricity storage systems combined with installations generating renewable electricity for self-consumption without liability for any double charge, including grid fees for stored electricity which remains within their premises;***

(***c***) maintain their rights ***and obligations as final*** consumers;

(***d)*** receive a remuneration***, including where applicable through support schemes,*** for the self-generated renewable electricity they feed into the grid which reflects the market value ***and may take into account the long-term value*** of the electricity fed in ***to the grid, the environment and society***.

▌

3. ***Member States may apply non-discriminatory and proportionate charges and fees to renewable self-consumers, in relation to their self-generated renewable electricity which remains within their premises in the following cases:***

(a) ***if the electricity produced by the self-consumer is effectively supported via support schemes, only to the extent that the economic viability of the project and incentive effect of such support are not undermined; or***

(b) ***starting from December 2026, if the overall share of self-consumption installations exceeds 8 % of a Member states total electricity capacity installed, the national regulatory authority may perform a cost-benefit analysis through an open, transparent and participatory process and if the result of this analysis demonstrates that the provision set out in paragraph 2(a)(ii) resulted in significant disproportionate burden on the long-term financial sustainability of the electric system or creates an incentive exceeding what it is objectively needed to achieve cost-effective deployment of renewable energy, and that such impact could not be minimised by taking other reasonable actions; or***

(c) ***if the electricity is produced in installations above 30 kW of total installed capacity.***

4. Member States shall ensure that renewable self-consumers ***located in the same building, including multi-apartment blocks, are entitled to engage jointly in activities set out in paragraph 2 and are allowed to arrange sharing of renewable energy that is produced on their site or sites between themselves, without prejudice to applicable grid costs and other relevant charges, levies and taxes*** to each renewable self-consumer ***if applicable. Member States may differentiate between renewable self-consumers and jointly acting renewable self-consumers. Any different treatment towards consumers participating in joint self-consumption shall be proportionate and duly justified***.

5. ***If subject to the instructions of the*** renewable self-consumer***, the renewable self-consumer'***s installation may be ***owned by a third party or it may be*** managed by a third party for installation, operation, including metering, and maintenance. ***The third party shall not be considered a renewable self-consumer itself.***

6. Member States shall put in place an enabling framework to promote and facilitate the development of renewable self-consumption based on an assessment of the existing unjustified barriers to and the potential of renewable self-consumption in their territories and energy networks. That enabling framework shall, inter alia:

(a) address accessibility of self-consumption to all final customers, including those in low-income or vulnerable households;

(b) address unjustified barriers to the financing of projects in the market and measures to facilitate access to finance;

(c) address other possible unjustified regulatory barriers to renewable self-consumption, including for tenants;

(d) address incentives to building owners to create opportunities for self-consumption, including for tenants;

(e) grant self-consumers for self-generated renewable electricity they feed into the grid, non-discriminatory access to relevant support schemes in place as well as all electricity market segments;

(f) ensure that renewable self-consumers contribute in an adequate and balanced way to the overall cost sharing of the system when electricity is injected into the grid.

Member States shall include a summary of the policies and measures under the enabling framework and an assessment of their implementation respectively in their integrated national energy and climate plans and in their progress reports pursuant to Regulation ... of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD)].

This Article shall be without prejudice to Article 107 and 108 TFEU.

Article 22

Renewable energy communities

1. Member States shall ensure that ***final customers, in particular household customers, are entitled to participate in a renewable energy community without losing their rights or obligations as final customers, and*** without being subject to ***unjustified or discriminatory conditions or*** procedures ***that would prevent their participation in a renewable energy community, provided that for private undertakings, their participation does not constitute their primary commercial or professional activity***.

2. Member States shall ensure that renewable energy communities are entitled:

(a) to generate, consume, store and sell renewable energy, including through power purchase agreements;

(b) to arrange sharing of renewable energy within the community that is produced by the production units owned by the community, subject to the provisions of this article and retaining community members' rights and obligations as customers;

(c) to access all suitable energy markets both directly or through aggregation in a non-discriminatory manner;

3. Member States shall carry out an assessment of the existing barriers and potential of development of renewable energy communities in their territories.

4. Member States shall provide an enabling framework to promote and facilitate the development of renewable energy communities. The framework shall ensure, inter alia, that:

(a) unjustified regulatory and administrative barriers to renewable energy communities are removed;

(b) renewable energy communities that supply energy, provide aggregation or other commercial energy services are subject to the provisions relevant for such activities;

(c) the relevant distribution system operator cooperates with renewable energy communities to facilitate energy transfers within renewable energy communities;

(d) renewable energy communities are subject to fair, proportionate and transparent procedures, including registration and licensing, and cost reflective network charges, as well as relevant levies and taxes, ensuring they contribute in an adequate, fair and balanced way to the overall cost sharing of the system in line with a transparent cost-benefit analysis of distributed energy sources developed by the national competent authorities;

(e) ***renewable energy communities are subject to a non-discriminatory treatment with regard to their activities, rights and obligations as final customers, generators, suppliers, distribution system operators, or as other market participants;***

(f) ***the participation in the renewable energy communities is accessible to all consumers, including those in low-income or vulnerable households;***

(g) ***tools to facilitate access to finance and information are available;***

(h) ***regulatory and capacity-building support is provided to public authorities in enabling and setting up renewable energy communities, and in helping authorities to participate directly;***

(i) ***rules to secure the equal and non-discriminatory treatment of consumers that participate in the renewable energy community.***

5. ***Major principles of the enabling framework and its implementation shall be part of the progress reports and updates of the integrated national energy and climate plans of Member States pursuant to Regulation ... of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD)].***

6. ***Member States may provide that renewable energy communities are open to cross-border participation.***

▌

7. Without prejudice to ***Articles 107 and 108 TFEU*** Member States shall take into account ▌ specificities of renewable energy communities ***when designing support schemes, in order to allow them to compete for support on an equal footing with other market participants***.

Article 23

Mainstreaming renewable energy in the heating and cooling installations

1. In order to facilitate the penetration of renewable energy in the heating and cooling sector, each Member State shall endeavour to increase the share of renewable energy supplied for heating and cooling by ***an indicative 1.3 percentage points as a yearly average calculated for the periods of 2021-2025 and 2026-2030 starting from the level achieved in 2020,*** expressed in terms of national share of final energy consumption and calculated according to the methodology set out in Article ***7, without prejudice to paragraph 2 below. This increase shall be limited to an indicative 1.1 percentage points for those Member States where waste heat and cold is not used. Member States shall prioritise best available technologies where appropriate.***

2. For the purposes of paragraph 1, when calculating the share of renewable energy supplied for heating and cooling and their yearly average increases as specified in paragraph 1, Member States:

(a) may count waste heat and cold towards the yearly increase in paragraph 1, subject to a limit of 40 % of the annual increase;

(b) Member States with a share of renewable energy in heating and cooling above 60 % may count any such share as fulfilling the yearly increase referred to in the first subparagraph;

(c) Member States with a share of renewable energy in heating and cooling above 50 % up to 60 % may count any such share as fulfilling half of the yearly increase referred to in the first subparagraph.

Member States may take into account cost-effectiveness in deciding on the measures to deploy renewable energy sources in heating and cooling reflecting structural barriers from the high share of natural gas, cooling and dispersed settlement structure with low population density.

Where these measures would result in lower level of average yearly increase as referred to in paragraph 1, Member States shall make it public, for instance by the means of their national energy and climate progress reports pursuant to Article 18 of Regulation … of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375(COD), and provide the Commission with a justification including choice of measures as referred to in the third subparagraph.

3. Member States may designate and make public, on the basis of objective and non-discriminatory criteria, a list of measures and the implementing entities, such as fuel suppliers, ***public or professional bodies,*** which shall contribute to the increase set out in paragraph 1.

4. The increase set out in paragraph 1 may ***inter alia*** be implemented through one or more of the following options:

(a) physical incorporation of renewable energy ***or waste heat and cold*** in the energy and energy fuel supplied for heating and cooling;

(b) direct mitigation measures such as installation of highly efficient renewable heating and cooling systems in buildings or renewable energy use ***or the use of waste heat and cold*** for industrial heating and cooling processes;

(c) indirect mitigation measures covered by tradable certificates proving compliance with the obligation through support to indirect mitigation measures, carried out by another economic operator such as an independent renewable technology installer or energy service company - ESCO providing renewable installation services;

(d) other policy measures, with an equivalent effect to reach the yearly increase set out in paragraph 1, including fiscal measures or other financial incentives.

When deciding or implementing the measures referred to in points (a) to (d) above, Member States shall aim for the accessibility of measures to all consumers, in particular those in low-income or vulnerable households, who may not possess sufficient up-front capital to benefit otherwise.

5. Member States may use the established structures under the national energy efficiency obligation schemes set out in Article 7 of Directive 2012/27/EU to implement and monitor the measures referred to in paragraph 3.

6. ***Where*** entities ***are*** designated under paragraph 3 ***Member States*** shall ensure that their contribution is measurable and verifiable and ***that the designated entities*** report annually ▌ on:

   (a) the total amount of energy supplied for heating and cooling;

   (b) the total amount of renewable energy supplied for heating and cooling;

   (c) ***the*** amount of ▌ ***waste heat or cold*** supplied for heating and cooling ▌ ;

   (d) ***the share of renewable energy and waste heat or cold in the total amount of energy supplied for heating and cooling; and***

   (e) the type of renewable energy source.

▌

Article 24

District Heating and Cooling

1. Member States shall ensure that ▌ information ***is provided*** to ***final*** consumers on ***the*** energy performance and the share of renewable energy in their ***district heating and cooling*** systems ***in an easy to access manner, such as on suppliers' websites, on annual bills or upon request***.

2. Member States shall lay down the necessary measures ***and conditions*** to allow customers of those district heating or cooling systems which are not 'efficient district heating and cooling' within the meaning of Article 2(41) of Directive 2012/27/EU***, or will not become such a system by 2025 based on a plan approved by the competent authority, to disconnect by terminating or modifying their contract*** in order to produce heating or cooling from renewable energy sources themselves ▌**.**

In case the termination of contract is linked to physical disconnection, such contract termination may be made conditional on the compensation for cost directly caused by physical disconnection and the undepreciated portion of assets needed to provide heat and cold to that customer.

3. Member States may restrict the right to disconnect ***by terminating or modifying their contract*** to customers who can prove that the planned alternative supply solution for heating or cooling results in a significantly better energy performance. The performance assessment of the alternative supply solution may be based on the Energy Performance Certificate as defined in Directive 2010/31/EU.

4. Member States shall lay down the necessary measures to ensure ***that*** district heating or cooling systems ***contribute to the increase referred to in Article 23 paragraph 1 by implementing at least one of the two following options:***

(a) Endeavour to increase the share of renewable energy sources and from waste heat and cold sources in district heating and cooling by at least 1 percentage point as a yearly average calculated for the periods of 2021-2025 and 2026-2030, starting from the level achieved in 2020, expressed in terms of share of final energy consumption for district heating and cooling, by implementing measures that can be expected to trigger this yearly increase in years with normal climatic conditions.

Member States with a share of renewable energy and waste heat and cold in district heating and cooling above 60 % may count any such share as fulfilling the yearly increase referred to in paragraph 4a.

Member States shall lay down the necessary measures to implement the increase set out in paragraph 4 (a) in their national energy and climate plans pursuant to Annex I of Regulation … of the European Parliament and of the Council [on the Governance of the Energy Union, 2016/0375 (COD)].

(b) ***Ensure that operators of district heating or cooling systems are obliged to connect suppliers of energy from renewable energy sources and waste heat and cold or have to offer to connect and purchase heat and cold produced from renewable energy sources and waste heat and cold from third party suppliers based on non-discriminatory criteria set by the competent authority of the Member State when they need to:***

(i) ***meet demand from new customers;***

(ii) ***replace existing heat and cold generation capacities; and***

(iii) ***expand existing heat and cold generation capacities.***

5. ***When the option in paragraph 4 (b) is implemented, an*** operator of a district heating or cooling system may refuse ▌to ***connect and buy heat or cold from third party*** suppliers where***:***

(a) the system lacks the necessary capacity due to other supplies of waste heat or cold, of heat or cold from renewable energy sources or of heat or cold produced by high-efficiency cogeneration***;***

(b) ***the heat or cold supplied from the third party does not meet the technical parameters necessary to connect and ensure the reliable and safe operation of the district heating and cooling system; or***

(c) ***it can demonstrate that providing access would lead to an excessive heat or cold cost increase for final customers compared to the cost of using the main local heat supply with which the renewable energy source or waste head or cold would compete***.

Member States shall ensure that ***when*** the operator of the district heating or cooling system ***refuses to connect a supplier of heating or cooling*** information ***is provided by the operator*** to the competent authority according to paragraph 9 on ***the reasons for the refusal, as well as the conditions and*** measures that would ***need*** to ***be taken in*** the system ***in order to enable the connection***.

6. ***When the option in paragraph 4 (b) is implemented, Member States may exempt from the application of paragraph 4 (b):***

   (a) district heating or cooling systems that constitute 'efficient district heating and cooling' within the meaning of Article 2(41) of Directive 2012/27/EU or where that efficient district heating and cooling exploits 'high efficiency cogeneration' within the meaning of Article 2(34) of Directive 2012/27/EU;

   (b) existing district heating or cooling systems that become efficient in the sense of Article 2(41) of Directive 2012/27/EU by 2025 based on a plan approved by the competent authority;

   (c) district heating and cooling systems with a total rated thermal input below 20 MW.

7. The right to disconnect ***by terminating or modifying of their contract*** may be exercised by individual customers, by joint undertakings formed by customers or by parties acting on the behalf of customers. For multi-apartment blocks, such disconnection ***by termination or modification of their contract*** may only be exercised at whole building level ***in accordance with the applicable dwelling law***.

8. Member States shall require electricity distribution system operators to assess at least ***every four years***, in cooperation with the operators of district heating or cooling systems in their respective area, the potential of district heating or cooling systems to provide balancing and other system services, including demand response and storing of excess electricity produced from renewable sources and if the use of the identified potential would be more resource- and cost-efficient than alternative solutions.

9. Member States shall ▌ ensure that the rights of consumers and the rules for operating district heating and cooling systems in accordance with this Article are clearly defined and enforced ***by the competent authority***.

10. Member States may decide not to apply paragraphs 2 to 9 of this Article if:

(a) their share of district heating and cooling is less than 2 % of the overall consumption of energy for heating and cooling at [the entry into force of this Directive]; or

(b) if they are increasing the share in point (a) of this paragraph beyond 2 % by developing new efficient district heating and cooling systems as referred to in Article 2(41) of Directive 2012/27/EU based on their integrated national energy and climate plans or the assessment referred to in Article 15(8); or

(c) the share of systems referred in the paragraph 6 of this article constitute over 90% of total sales of district heating and cooling in a member state.

Article 25

Mainstreaming renewable energy in the transport sector

1. ***In order to mainstream renewable energy use in the transport sector, each Member State shall set an obligation on fuel suppliers to ensure the share of renewable energy supplied for final consumption in the transport sector is at least 14 % by 2030, following an indicative trajectory set by the Member State and calculated in accordance to the methodology set out in this article. The Commission shall assess this obligation, with a view to submit a legislative proposal by 2023 to review it upwards where there are further substantial costs reductions in renewable energy production, or where needed to meet the Union's international commitments for decarbonisation or where a significant decrease in energy consumption in the Union justifies it. Member States may decide to include in such a minimum share also the contribution from recycled carbon fuels. Member States may exempt or distinguish between different fuel suppliers and energy carriers when setting this obligation, ensuring varied maturity and cost of technologies is taken into account.***

For the calculation of the first subparagraph, renewable liquid and gaseous transport fuels of non-biological origin shall also be taken into account when these are used as intermediate product for the production of conventional fuels.

▌Within this total share, the contribution of▌ biofuels and biogas produced from feedstock listed in part A of Annex IX shall be at least ***equal to 0,2 % in 2022, 1 % in 2025 and,*** increasing up to at least ***3,5 % by 2030.***

Member States may exempt fuel suppliers supplying fuels in the form of electricity and renewable liquid and gaseous transport fuels of non-biological origin from complying in respect to these fuels with the minimum share of advanced biofuels, other biofuels and biogas produced from feedstock listed in Annex IX.

Within this total share, the contribution of renewable electricity shall be considered to be 4 times its energy content when supplied to road vehicles. Within this total share, the contribution of renewable electricity may be considered to be 1.5 times the energy content when supplied to rail transport.

When setting the obligation under the first and third subparagraphs to ensure the achievement of the share set out therein, Member States may do so, inter alia, by measures targeting volumes, energy content or greenhouse gas emission savings provided that it is demonstrated that the shares set out in the first and second subparagraph are achieved.

For the purpose of demonstrating compliance with the obligation under the first and third subparagraphs of paragraph 1, Member States may consider the contribution of biofuels and biogas produced from feedstock listed in Annex IX to be twice their energy content.

The greenhouse gas emission savings from the use of ***renewable liquid and gaseous transport fuels of non-biological origin excluding recycled carbon fuels*** shall be at least 70 % as of 1 January 2021.

Appropriate minimum thresholds for greenhouse gas emission savings of recycled carbon fuels shall be established through life cycle assessment that takes into account the specificities of each fuel. The thresholds shall be set by the Commission at the latest by 1 January 2021 by the means of a delegated act.

For the calculation of a Member State's gross final consumption of energy from renewable energy sources set out in Article 7 and the share set out in the first subparagraph of this Article, the contribution from biofuels and bioliquids, as well as from biomass fuels consumed in transport, if produced from food or feed crops, shall be no more than 1 percentage point higher than the contribution from those to the gross final consumption of energy from renewable energy sources in 2020 in that Member State, with a maximum of 7 % of gross final consumption in road and rail transport in that Member State.

Where this contribution is below 1 % in a Member State, the contribution may be increased to a maximum of 2 % of the gross final consumption in road and rail transport.

Member States may set a lower limit and may distinguish for the purpose of Article 26(1) between types of biofuels, bioliquids and biomass fuels produced from food and feed crops, taking into account best available evidence on indirect land-use change impact. Member States may for instance set a lower limit for the contribution from food or feed crop-based biofuels, bioliquids and biomass fuels produced from oil crops.

In case the contribution from biofuels and bioliquids, as well as from biomass fuels consumed in transport, produced from food and feed crops in a Member State is limited to a share lower than 7 % and/or a Member State decides to limit the contribution further, that Member State may reduce the overall share referred to in the first subparagraph accordingly by maximal 7 percentage points.

The contribution to the targets set out in Article 3(1) and for the calculation of the numerator (1) from high indirect land-use change risk food or feed crop-based biofuels, bioliquids and biomass fuels produced from food or feed crops for which a significant expansion of the production area into land with high carbon stock is observed, shall not exceed the level of consumption in 2019 in the Member State, unless they are certified as low indirect land-use change-risk biofuels, bioliquids and biomass fuels pursuant to the following two subparagraphs: As of 31 December 2023, this limit shall decrease gradually to 0 % by 31 December 2030 at the latest.

The Commission shall submit, by 1 February 2019, to the European Parliament and the Council a report on the status of production expansion of relevant food and feed crops worldwide and shall adopt, by 1 February 2019, a delegated act setting out the criteria for certification of low indirect land-use change-risk biofuels, bioliquids and biomass fuels and for determining the high indirect land-use change risk feedstocks for which a significant expansion of the production area into land with high carbon stock is observed. The report and the accompanying delegated act shall be based on the best available scientific data.

By 1 September 2023 the Commission shall review the criteria set out by the delegated act referred to in the previous subparagraph based on the best available scientific data and adopt a delegated act amending, where appropriate, such criteria and including the trajectory to gradually decrease the contribution to the targets set out in in Article 3(1) and Article 25(1) of high indirect land-use change risk biofuels, bioliquids and biomass fuels produced from feedstocks for which a significant expansion of the production into land with high carbon stock is observed.

For the calculation of the shares referred to in the ***first and third*** sub***paragraphs of*** paragraph ***1,*** the following provisions shall apply:

(a) for the calculation of the denominator, that is the energy content of road and rail transport fuels supplied for consumption or use on the market, petrol, diesel, natural gas, biofuels, biogas, renewable liquid and gaseous transport fuels of non-biological origin, ***recycled carbon*** fuels and electricity ***supplied to road and rail transport***, shall be taken into account;

(b) for the calculation of the numerator, ***that is the amount of energy from renewable sources consumed in transport for the purposes of the first subparagraph,*** the energy content of ***all types of energy from renewable sources*** supplied to all transport sectors, and renewable electricity supplied to road ***and rail transport***, shall be taken into account. ***Recycled carbon fuels shall be taken into account if a Member State decides to do so;***

For the calculation of the numerator, the contribution from biofuels and biogas produced from feedstock included in part B of Annex IX shall be limited to 1,7 % of the energy content of transport fuels supplied for consumption or use on the market***. In the case of Malta and Cyprus the 1,7 % limit for Part B of Annex IX shall not apply. Member States can modify the limit set on feedstock included in part B of Annex IX if justified taking into account the availability of feedstock. Any modification shall be subject to the approval of the Commission. With the exception of fuels produced from food or feed crops,*** the contribution of fuels supplied in the aviation and maritime sector shall be considered to be ***1,2*** times their energy content.

(c) For the calculation of both numerator and denominator, the values regarding the energy content of transport fuels, as set out in Annex III, shall be used. For the determination of the energy content of transport fuels not included in Annex III, the Member States shall use the respective ESOs standards for determination of calorific values of fuels. Where no ESOs standard has been adopted for this purpose, the respective ISO standards shall be used.

▌

The Commission is empowered to adopt delegated acts in accordance with Article 32 concerning the adaptation of the energy content of transport fuels, as set out in Annex III, to scientific and technical progress.

2. To determine the share of renewable electricity for the purposes of paragraph 1 ▌ the share of electricity from renewable energy sources in the Member State where the electricity is supplied, as measured two years before the year in question may be used. ▌

By way of derogation from the first subparagraph, to determine the share of electricity for the purposes of paragraph 1 in the case of electricity obtained from a direct connection to an installation generating renewable electricity and supplied to road vehicles, that electricity shall be fully counted as renewable.

▌

In order to ensure that the expected increase in demand of electricity in the transport sector beyond the current baseline is provided by additional renewable capacities, the Commission shall develop a framework on additionality in the transport sector and present options in view of determining Member States' baseline and of measuring additionality.

For the purposes of this paragraph, the following provisions shall apply:

(a) When electricity is used for the production of renewable liquid and gaseous transport fuels of non-biological origin, either directly or for the production of intermediate products, the average share of electricity from renewable energy sources in the country of production, as measured two years before the year in question, may be used to determine the share of renewable energy.

However, electricity obtained from direct connection to an installation generating renewable electricity (i) that comes into operation after or at the same time as the installation producing the renewable liquid and gaseous transport fuel of non-biological origin and (ii) is not connected to ***the grid or is connected to the grid but can provide evidence that the respective electricity has been provided without importing electricity from*** the grid, can be fully counted as renewable electricity for the production of that renewable liquid and gaseous transport fuel of non-biological origin.

In addition, electricity that has been imported from the grid may be counted as fully renewable if the electricity is produced exclusively from renewable energy sources and the renewable properties and any other appropriate criteria have been demonstrated, ensuring that the renewable properties of this electricity are claimed only once and only in one end-use sector.

The Commission shall adopt a delegated act in accordance with Article 32 to establish a common European methodology, setting out detailed rules for economic operators to comply with the requirements set out in the previous two subparagraphs by December 2021.

3. ***With a view to minimising the risk of single consignments being claimed more than once in the Union, Member States and the Commission shall strengthen cooperation among national systems and between national systems and voluntary schemes and verifiers established pursuant to Article 27, including, where appropriate, the exchange of data. Where an authority suspects or detects a fraud it shall, where appropriate, inform other Member States of the issue.***

4. ***The Commission*** shall ***ensure that a database is*** put in place ▌enabling tracing of ***liquid and gaseous*** transport fuels that are eligible for counting towards the numerator set out in paragraph 1(b) ***or taken into account for the purposes referred to in points (a), (b), and (c) of Article 26(1), and Member States shall*** require the relevant economic operators to enter information on the transactions made and the sustainability characteristics of ▌***these*** fuels, including their life cycle greenhouse gas emissions, starting from their point of production to the fuel supplier that places the fuel on the market. ***Member States may set up a national database that is linked to the one put in place by the Commission ensuring that information entered is instantly transferred.***

The ***fuel suppliers*** shall ***enter the information necessary to verify compliance with the requirements set out in paragraph 1, first subparagraph.***

▌

5. ***By 31 December 2021 Member States shall take measures to ensure the availability of renewable fuels and sources for transport including publicly accessible high-power recharging points and other refuelling infrastructure as foreseen in their national policy frameworks under Directive 2014/94/EU.***

6. ***Member States shall have access to the database and take measures to ensure that within each Member States economic operators enter the correct information. The Commission shall require the schemes that are the subject of a decision pursuant to paragraph 4 of Article 27 to verify compliance with this requirement when checking compliance with the sustainability criteria for biofuels, bioliquids and biomass fuels and shall publish, every two years,*** aggregated information from the ***database pursuant to Annex VIII*** of Regulation [***on the*** Governance ***of the Energy Union, 2016/0375(COD)***].

7. ***By 31 December 2021, the*** Commission ***shall*** adopt delegated acts in accordance with Article 32 to ▌specify the methodology▌ to determine the share of biofuel resulting from biomass being processed with fossil fuels in a common process, ***and*** to specify the methodology for assessing greenhouse gas emission savings from renewable liquid and gaseous transport fuels of non-biological origin and ***recycled carbon fuels, which shall ensure that no credit for avoided emissions be given for carbon dioxide whose capture already received an emission credit under other legal provisions.***

8. ***The Commission is empowered to adopt delegated acts in accordance with Article 32 to amend the list of feedstocks in parts A and B of Annex IX in order to add feedstocks, but not to remove them. Feedstocks that can only be processed with advanced technologies shall be added to Annex IX part A while feedstocks that can be processed into biofuels with mature technologies shall be added to Annex IX Part B.***

Each delegated act amending the list of feedstocks in parts A and B shall be based on an analysis of the potential of the raw material as a feedstock for the production of biofuels taking into account:

(i) the principles of the circular economy and the waste hierarchy established in Directive 2008/98/EC;

(ii) the Union sustainability criteria set out in Article 26;

(iii) the need to avoid significant distortive effects on markets for (by-) products, wastes or residues;

(iv) the potential for delivering substantial greenhouse gas emission savings compared to fossil fuels based on life-cycle assessment of emissions;

(v) the need to avoid negative impacts on the environment and biodiversity; and

(vi) the need to avoid creating an additional demand for land.

Every 2 years, the Commission shall carry out an evaluation of the list of feedstocks in parts A and B of Annex IX in order to add feedstocks, in line with the principles set out in this paragraph. The first evaluation shall be carried out no later than 6 months after [date of entry into force of this Directive].

9. By 31 December 2025, in the context of the biennial assessment of progress made pursuant to Regulation ***… of the European Parliament and of the Council [on the*** Governance ***of the Energy Union, 2016/0375(COD)***], the Commission shall assess whether the obligation laid down in ***the first subparagraph of*** paragraph 1 ***regarding advanced biofuels*** effectively stimulates innovation and ***ensures*** greenhouse gas savings in the transport sector ▌***. The assessment shall also analyse if the provisions in this article effectively avoid double accounting of renewable energy***. The Commission shall, if appropriate, present a proposal to modify the obligation laid down in paragraph ***1 subparagraph 3 in relation to advanced biofuels.***

Article 26

Sustainability and greenhouse gas emissions saving criteria for biofuels, bioliquids and biomass fuels

1. Energy from biofuels, bioliquids and biomass fuels shall be taken into account for the purposes referred to in points (a), (b) and (c) of this paragraph only if they fulfil the sustainability criteria set out in paragraphs 2 to 6 and the greenhouse gas emissions saving criteria set out in paragraph 7 ▌:

   (a) contributing towards the Union target and Member States renewable energy share;

   (b) measuring compliance with renewable energy obligations , including the ***obligation*** set out in ***Article*** 25 ;

   (c) eligibility for financial support for the consumption of biofuels, bioliquids and biomass fuels ▌.

However, biofuels, bioliquids and biomass fuels produced from waste and residues, other than agricultural, aquaculture, fisheries and forestry residues, need only fulfil the greenhouse gas emissions saving criteria set out in paragraph 7 in order to be taken into account for the purposes referred to in points (a), (b) and (c) of this paragraph. This provision shall also apply to waste and residues that are first processed into a product before being further processed into biofuels, bioliquids and biomass fuels. ***Electricity, heating and cooling produced from municipal solid waste shall not be subject*** to ▌the▌ greenhouse gas emissions ***savings criteria set out in paragraph 7.***

Biofuels, bioliquids and biomass fuels produced from waste and residues not from forest but from agricultural land shall be taken into account for the purposes referred to in points (a), (b) and (c) of this paragraph if operators or national authorities have monitoring or management plans in place in order to address impacts on soil quality and soil carbon. Information about how impacts are monitored and managed shall be reported pursuant to Article 27(3).

Biomass fuels shall have to fulfil the sustainability and greenhouse gas emissions saving criteria set out in paragraphs 2 to 7 ▌if used in installations producing electricity, heating and cooling or fuels with a ***total rated thermal input*** equal to or exceeding 20 MW in case of solid biomass fuels and with ***a total rated thermal input*** capacity equal to or exceeding ***2*** MW in case of gaseous biomass fuels. Member States may apply the sustainability and greenhouse gas emission saving criteria to installations with lower fuel capacity.

The sustainability criteria set out in paragraphs 2 to 6 and the greenhouse gas emissions saving criteria set out in paragraph 7 shall apply irrespectively of the geographical origin of the biomass.

2. Biofuels, bioliquids and biomass fuels produced from agricultural biomass taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 shall not be made from raw material obtained from land with high biodiversity value, namely land that had one of the following statuses in or after January 2008, whether or not the land continues to have that status:

(a) primary forest and other wooded land, namely forest and other wooded land of native species, where there is no clearly visible indication of human activity and the ecological processes are not significantly disturbed;

(***b)*** ***highly biodiverse forest and other wooded land which is species-rich and not degraded, or has been identified as being highly biodiverse by the relevant competent authority, unless evidence is provided that the production of that raw material did not interfere with those nature protection purposes;***

(c) areas designated:

(i) by law or by the relevant competent authority for nature protection purposes; or

(ii) for the protection of rare, threatened or endangered ecosystems or species recognised by international agreements or included in lists drawn up by intergovernmental organisations or the International Union for the Conservation of Nature, subject to their recognition in accordance with the first subparagraph of Article 27(4);

unless evidence is provided that the production of that raw material did not interfere with those nature protection purposes;

(d) highly biodiverse grassland spanning more than one hectare that is:

(i) natural, namely grassland that would remain grassland in the absence of human intervention and which maintains the natural species composition and ecological characteristics and processes; or

(ii) non-natural, namely grassland that would cease to be grassland in the absence of human intervention and which is species-rich and not degraded and has been identified as being highly biodiverse by the relevant competent authority, unless evidence is provided that the harvesting of the raw material is necessary to preserve its status as highly biodiverse grassland.

The Commission may ***further specify*** the criteria to determine which grassland shall be covered by point (d) by means of implementing acts adopted in accordance with the examination procedure referred to in Article 31(3).

3. Biofuels , bioliquids and biomass fuels produced from agricultural biomass taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 shall not be made from raw material obtained from land with high carbon stock, namely land that had one of the following statuses in January 2008 and no longer has that status:

(a) wetlands, namely land that is covered with or saturated by water permanently or for a significant part of the year;

(b) continuously forested areas, namely land spanning more than one hectare with trees higher than five metres and a canopy cover of more than 30 %, or trees able to reach those thresholds in situ;

(c) land spanning more than one hectare with trees higher than five metres and a canopy cover of between 10 % and 30 %, or trees able to reach those thresholds in situ, unless evidence is provided that the carbon stock of the area before and after conversion is such that, when the methodology laid down in part C of Annex V is applied, the conditions laid down in paragraph 7 of this Article would be fulfilled.

The provisions of this paragraph shall not apply if, at the time the raw material was obtained, the land had the same status as it had in January 2008.

4. Biofuels, bioliquids and biomass fuels produced from agricultural biomass taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 shall not be made from raw material obtained from land that was peatland in January ***2008, unless evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil.***

5. Biofuels, bioliquids and biomass fuels produced from forest biomass taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 shall meet the following requirements to minimise the risk of using ▌ forest biomass ***derived from unsustainable*** production:

(a) the country in which forest biomass was harvested has national and/or sub-national laws applicable in the area of harvest as well as monitoring and enforcement systems in place ensuring that:

(i) ***the legality*** of ▌ harvesting ***operations;***

(ii) forest regeneration of harvested areas ▌***;***

(iii) ***areas designated by international or national laws or by the relevant competent authority for nature protection purposes, including in*** wetlands and peatlands, are protected;

(iv) ▌ harvesting ***is carried out considering maintenance of*** soil quality and biodiversity ***with the aim of minimising negative impacts***; and

(v) harvesting ***maintains or improves*** the long-term production capacity of the forest;

(b) when evidence referred to in the first subparagraph is not available, the biofuels, bioliquids and biomass fuels produced from forest biomass shall be taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 if management systems are in place at forest ***sourcing area*** level to ensure ▌:

▌

(i) the legality of harvesting operations;

(ii) forest regeneration of harvested areas ▌;

(iii) ***areas designated by international or national laws or by the relevant competent authority for nature protection purposes, including in wetlands and peatlands, unless evidence is provided that the harvesting of that raw material did not interfere with those nature protection purposes, are*** protected;

(iv) harvesting is carried out considering maintenance of soil quality and biodiversity; ***and***

(v) harvesting ***maintains or improves*** long-term production capacity of the forest.

6. Biofuels, bioliquids and biomass fuels produced from forest biomass ▌ taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 ***shall meet the following LULUCF requirements:***

(a) the country or regional economic integration organisation of origin of the forest biomass ▌:

(i) is a Party to ▌ the Paris agreement;

(***ii***) has submitted a Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC), covering emissions and removals from agriculture, forestry and land use which ensures that either changes in carbon stock associated with biomass harvest are accounted towards the country's commitment to reduce or limit greenhouse gas emissions as specified in the NDC; or

(iii) there are national or sub-national laws in place, in accordance with Article 5 of the Paris Agreement, applicable in the area of harvest, to conserve and enhance carbon stocks and sinks***, and providing evidence that reported LULUCF sector emissions do not exceed removals;***

▌

(b) ***when*** evidence referred to in ***point (a)*** is not available, the biofuels, bioliquids and biomass fuels produced from forest biomass shall be taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 if management systems are in place at forest ***sourcing area*** level to ensure that carbon stocks and sinks levels in the forest are maintained***, or strengthened over the long term***.

By 31 January 2021, the Commission***, shall*** establish the operational ***guidance on the*** evidence for demonstrating compliance with the requirements set out in paragraphs 5 and 6, by means of implementing acts adopted in accordance with the examination procedure referred to in Article 31(3).

By 31 December ***2026,*** the Commission shall assess whether the criteria set out in paragraphs 5 and 6 effectively minimise the risk of using ▌forest biomass ***derived from unsustainable production*** and address LULUCF requirements, on the basis of available data. The Commission shall, if appropriate, present a proposal to modify the requirements laid down in paragraphs 5 and ***6 for the period after 2030.***

7. The greenhouse gas emission saving from the use of biofuels, bioliquids and biomass fuels taken into account for the purposes referred to in paragraph 1 shall be:

(a) at least 50 % for biofuels***, biogas consumed in transport*** and bioliquids produced in installations in operation on or before 5 October 2015;

(b) at least 60 % for biofuels***, biogas consumed in transport*** and bioliquids produced in installations starting operation from 5 October 2015;

(c) at least ***65*** % for biofuels***, biogas consumed in transport*** and bioliquids produced in installations starting operation after 1 January 2021;

(d) at least ***70*** % for electricity, heating and cooling production from biomass fuels used in installations starting operation after 1 January 2021 and ***80*** % for installations starting operation after 1 January ***2026.***

An installation shall be considered to be in operation once the physical production of biofuels or bioliquids and of heating and cooling, and electricity for biomass fuels has started.

The greenhouse gas emission saving from the use of biofuels, bioliquids and biomass fuels used in installations producing heating, cooling and electricity shall be calculated in accordance with Article 28(1).

8. Electricity from biomass fuels ▌ shall be taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 ***of this Article only if it meets the following requirements, and for electricity-only-installations provided that these do not use fossil fuels as a main fuel:***

(a) It is produced in installations with a total rated thermal input below 50 MW; or

(b) For installations with a total rated thermal input between 50 and 100 MW, it is produced applying high efficient cogeneration technology as defined under Article 2(34) of Directive 2012/27/EU, or for electricity-only installations meeting the Best Available Technology associated net-electrical efficiency levels (BAT-AEELs) as defined in the Commission Implementing Decision (EU) 2017/1442, or applying Biomass Carbon Capture and Storage; or

(c) For installations with a total rated thermal input above 100 MW, it is produced either applying high efficient cogeneration technology as defined under Article 2(34) of Directive 2012/27/EU, or for electricity-only installations achieving an net-electrical efficiency of 36 %, or applying Biomass Carbon Capture and Storage.

For the purposes referred to in points (a), (b) and (c) of paragraph 1 of this Article, electricity-only-installations shall only be taken into account if there is not a cost-effective potential for the application of high-efficiency cogeneration according to the assessment undertaken under Article 14 of Directive 2012/27/EU.

For the purposes of points (a) and (b) of paragraph ***1 of*** this ***Article, these provisions*** shall only apply to installations starting operation ***or converted to biomass fuels*** after ▌3 years from date of adoption of this Directive▌. For the purposes of point (c) of paragraph ***1 of*** this ***Article, these provisions are*** without prejudice to public support provided under schemes approved by ▌3 years after date of adoption of this Directive▌**.**

Member States may apply higher energy efficiency requirements than those referred in points a) to c) of this paragraph to installations with lower fuel capacity.

The first subparagraph shall not apply to electricity from installations which are the object of a specific notification by a Member State to the Commission based on the duly substantiated existence of risks for the security of supply of electricity. Upon assessement of the notification, the Commission shall adopt a decision taking into account the elements included therein.

9. For the purposes referred to in points (a), (b) and (c) of paragraph 1, ***and without prejudice to Article 25(1),*** Member States shall not refuse to take into account, on other sustainability grounds, biofuels and bioliquids obtained in compliance with this Article. ***This provision is without prejudice to public support granted under schemes approved before [date of entry into force of this Directive].***

10. For the purpose referred to in point (c) of paragraph 1, Member States may derogate, for a limited period of time, from the criteria set out in paragraphs 1 to 8 of this Article by adopting different criteria applying to:

(a) installations located in an outermost region as referred to in Article 349 TFEU to the extent that such facilities produce electricity or heating or cooling from biomass fuels; and

(b) biomass fuels used in the installations referred to in point (a), irrespective of the place origin of that biomass, provided that such criteria are objectively justified for reasons of ensuring, for this outermost region, a smooth phase-in of the criteria set out in paragraphs 1 to 8 of this Article and thereby incentivise the transition from fossil fuels to sustainable biomass fuels.

The different criteria referred in this paragraph shall be subject to a specific notification by a Member State to the Commission.

11. For the purposes referred to in points (a), (b) and (c) of paragraph 1, Member States may place additional sustainability requirements for biomass fuels. ***By 31 December 2026 the Commission shall assess the impact that such additional criteria may have on the internal market, accompanied, if necessary, by proposals to ensure harmonization of sustainability criteria for biomass fuels.***

Article 27

Verification of compliance with the sustainability and greenhouse gas emissions saving criteria ▌

1. Where biofuels, bioliquids ▌ biomass fuels ***and/or other fuels that are eligible for counting towards the numerator set out in Article 25(1)(b)*** are to be taken into account for the purposes referred to in Articles 23 and 25 and in points (a), (b) and (c) of Article 26(1), Member States shall require economic operators to show that the sustainability and greenhouse gas emissions saving criteria set out in Article 26 (2) to (7) have been fulfilled. For ***those purposes*** they shall require economic operators to use a mass balance system which:

(a) allows consignments of raw material or ▌ fuels with differing sustainability and greenhouse gas emissions saving characteristics to be mixed for instance in a container, processing or logistical facility, transmission and distribution infrastructure or site;

(b) allows consignments of raw material with differing energy content to be mixed for the purpose of further processing, provided that the size of consignments is adjusted according to their energy content;

(c) requires information about the sustainability and greenhouse gas emissions saving characteristics and sizes of the consignments referred to in point (a) to remain assigned to the mixture; and

(d) provides for the sum of all consignments withdrawn from the mixture to be described as having the same sustainability characteristics, in the same quantities, as the sum of all consignments added to the mixture and requires that this balance be achieved over an appropriate period of time.

The mass balance system shall furthermore ensure that each consignment is considered only once in point (a), (b) or (c) of the first subparagraph of article 7(1), for calculating the gross final consumption of energy from renewable sources and that information is given whether support has been provided to the production of that consignment, and the type of support scheme.

2. Where a consignment is processed, information on the sustainability and greenhouse gas emissions saving characteristics of the consignment shall be adjusted and assigned to the output in accordance with the following rules:

(a) when the processing of a consignment of raw material yields only one output that is intended for the production of biofuels, bioliquids ▌ biomass fuels, ***renewable liquid and gaseous transport fuels of non-biological origin or recycled carbon fuels*** the size of the consignment and the related quantities of sustainability and greenhouse gas emissions saving characteristics shall be adjusted applying a conversion factor representing the ratio between the mass of the output that is intended for the production of biofuels, bioliquids or biomass fuels and the mass of the raw material entering the process;

(b) when the processing of a consignment of raw material yields more than one output that is intended for the production of biofuels, bioliquids ▌ biomass fuels, ***renewable liquid and gaseous transport fuels of non-biological origin or recycled carbon fuels*** for each output a separate conversion factor shall be applied and a separate mass balance shall be used.

3. Member States shall take measures to ensure that economic operators submit reliable information regarding the compliance with the sustainability and greenhouse gas emissions saving criteria set out in ***Article 25(7) and*** Article 26(2) to (7) and make available to the Member State, on request, the data that were used to develop the information. Member States shall require economic operators to arrange for an adequate standard of independent auditing of the information submitted, and to provide evidence that this has been done. ***For the compliance with articles 26(5)a and 26(6)a on forest biomass first or second party auditing may be used up to the first gathering point of the biomass.*** The auditing shall verify that the systems used by economic operators are accurate, reliable and protected against fraud ***including verification ensuring that materials are not intentionally modified or discarded so that the consignment or part thereof could become a waste or residue under Article 26(2) to (7)***. It shall evaluate the frequency and methodology of sampling and the robustness of the data ▌ .

The obligations laid down in this paragraph shall apply whether the biofuels, bioliquids , and biomass ***fuels, renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon*** fuels are produced within the Union or imported***. Information on geographic origin and feedstock type of biofuels, bioliquids and biomass fuels per fuel supplier shall be made available to consumers on websites of operators, suppliers or authorities and shall be updated on an annual basis***.

Member States shall submit to the Commission, in aggregated form, the information referred to in the first subparagraph of this paragraph. The Commission shall publish that information on the e-reporting platform referred to in Article 24 of Regulation [Governance] in summary form preserving the confidentiality of commercially sensitive information.

4. The Commission may decide that voluntary national or international schemes setting standards for the production of ***biofuels, bioliquids, biomass fuels and/or other fuels that are eligible for counting towards the numerator set out in Article 25(1)(b) provide accurate data on greenhouse gas emission savings*** for the purposes of Article ***25 and Article 26(7), and/or demonstrate that the provisions set out in Article 25(2), (4) and (6) have been respected*** and/or demonstrate that consignments of biofuels, bioliquids or biomass fuels comply with the sustainability criteria set out in Article 26(2), (3), (4), (5) and (6) ▌. When demonstrating that requirements set out in Article 26(5) and (6) for forest biomass are met, the operators may decide to directly provide the required evidence at the ***sourcing area*** level. The Commission may also recognise areas for the protection of rare, threatened or endangered ecosystems or species recognised by international agreements or included in lists drawn up by intergovernmental organisations or the International Union for the Conservation of Nature for the purposes of Article 26(2)(c)(ii).

The Commission may decide that those schemes contain accurate information on measures taken for soil, water and air protection, the restoration of degraded land, the avoidance of excessive water consumption in areas where water is scarce, and for certification of biofuels and bioliquids with low indirect land-use change-risk.

5. The Commission shall adopt decisions under paragraph 4 only if the scheme in question meets adequate standards of reliability, transparency and independent auditing ***and provides adequate assurances that no materials have been intentionally modified or discarded so that the consignment or part thereof would fall under Annex IX***. In the case of schemes to measure greenhouse gas emission saving, such schemes shall also comply with the methodological requirements in Annex V or Annex VI . Lists of areas of high biodiversity value as referred to in Article 26 (2)(c)(ii) shall meet adequate standards of objectivity and coherence with internationally recognised standards and provide for appropriate appeal procedures.

The voluntary schemes referred to in paragraph 4 shall regularly, and at least once per year, publish a list of their certification bodies used for independent auditing, indicating for each certification body by which entity or national public authority it was recognised and which entity or national public authority is monitoring it.

In order to ensure that compliance with the sustainability and greenhouse gas emissions saving criteria ***as well as with the provisions on low or high direct and indirect land-use change-risk biofuels and bioliquids*** is verified in an efficient and harmonised manner and in particular to prevent fraud, the Commission ***shall*** specify detailed implementing rules, including adequate standards of reliability, transparency and independent auditing and require all voluntary schemes to apply those standards. When specifying these standards, the Commission shall pay special attention to the need to minimize administrative burden. This shall be done by means of implementing acts adopted in accordance with the examination procedure referred to in Article 31(***3***). Such acts shall set a time frame by which voluntary schemes need to implement the standards. The Commission may repeal decisions recognising voluntary schemes in the event that those schemes fail to implement such standards in the time frame provided for. ***Should a Member State raise concerns that a scheme is not operating according to the standards of reliability, transparency and independent auditing that constitute the basis for the Decision under paragraph 4, the Commission shall investigate the matter and take appropriate action.***

6. Decisions under paragraph 4 of this Article shall be adopted in accordance with the examination procedure referred to in Article 31(3). Such decisions shall be valid for a period of no more than five years.

The Commission shall require that each voluntary scheme on which a decision has been adopted under paragraph 4 submit ▌annually ▌by 30 April▌ a report to the Commission covering each of the points set out in ***Annex IX of Regulation [Governance]. The*** report shall cover the preceding calendar year.▌ The requirement to submit a report shall apply only to voluntary schemes that have operated for at least 12 months.

The Commission shall make the reports drawn up by the voluntary schemes available, in an aggregated form or in full if appropriate, on the e-reporting platform referred to in Article 24 of Regulation [Governance].

Member States may set up national schemes where compliance with the sustainability and greenhouse gas emissions saving criteria set out in Article 26(2) to (7) ***and the greenhouse gas emission savings requirement for renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuels set out in Article 25(1)*** is verified throughout the entire chain of custody involving competent national authorities.

A Member State may notify its national scheme to the Commission. The Commission shall give priority to the assessment of such a scheme. A decision on the compliance of such a notified national scheme with the conditions set out in this Directive shall be adopted in accordance with the examination procedure referred to in Article 31(3), in order to facilitate mutual bilateral and multilateral recognition of schemes for verification of compliance with the sustainability and greenhouse gas emissions saving criteria for biofuels, bioliquids and biomass fuels . Where the decision is positive, schemes established in accordance with this Article shall not refuse mutual recognition with that Member State's scheme, as regards the verification of compliance with the sustainability and greenhouse gas emissions saving criteria set out in Article 26(2) to (7).

7. When an economic operator provides proof or data obtained in accordance with a scheme that has been the subject of a decision pursuant to paragraph 4 or ***6,*** to the extent covered by that decision, a Member State shall not require the supplier to provide further evidence of compliance with the sustainability and greenhouse gas emissions saving criteria set out in Article 26(2) to (7).

Competent authorities of the Member States shall ▌supervise the operation of certification bodies that are ▌conducting independent auditing under a voluntary scheme. ***Certification bodies shall upon request of competent authorities submit all relevant information necessary to supervise the operation including the exact date, time and location of audits. In case Member States find issues of non-conformity, they shall inform promptly the voluntary scheme.***

8. At the request of a Member State, inter alia based on a request of an economic operator, the Commission shall, on the basis of available evidence, examine whether the sustainability and greenhouse gas emissions saving criteria set out in Article 26 in relation to a source of biofuel, bioliquid or biomass fuel have been met. Within six months of receipt of such a request and in accordance with the examination procedure referred to in Article 31(3), the Commission shall decide whether the Member State concerned may take biofuel or bioliquid from that source into account for the purposes referred to in points (a), (b) and (c) of Article 25(1) or whether, as a derogation from paragraph 7, the Member State may require the supplier of the source of biofuel, bioliquid or biomass fuel to provide further evidence of compliance with the sustainability and greenhouse gas emissions saving criteria.

Article 28

Calculation of the greenhouse gas impact of biofuels, bioliquids and biomass fuels

1. For the purposes of Article 26(7), the greenhouse gas emission saving from the use of biofuel, bioliquids and biomass fuels shall be calculated as follows:

(a) where a default value for greenhouse gas emission saving for the production pathway is laid down in part A or B of Annex V for biofuels and bioliquids and in part A of Annex VI for biomass fuels where the el value for those biofuels or bioliquids calculated in accordance with point 7 of part C of Annex V and for those biomass fuels calculated in accordance with point 7 of part B of Annex VI is equal to or less than zero, by using that default value;

(b) by using an actual value calculated in accordance with the methodology laid down in part C of Annex V for biofuels and bioliquids and in part B of Annex VI for biomass fuels;

(c) by using a value calculated as the sum of the factors of the formulas referred to in point 1 of part C of Annex V, where disaggregated default values in part D or E of Annex V may be used for some factors, and actual values, calculated in accordance with the methodology laid down in part C of Annex V, for all other factors; or

(d) by using a value calculated as the sum of the factors of the formulas referred to in point 1 of part B of Annex VI, where disaggregated default values in part C of Annex VI may be used for some factors, and actual values, calculated in accordance with the methodology laid down in part B of Annex VI, for all other factors.

2. Member States may submit to the Commission reports including information on the typical greenhouse gas emissions from cultivation of agricultural raw materials of those areas on their territory classified as level 2 in the nomenclature of territorial units for statistics (NUTS) or as a more disaggregated NUTS level in accordance with Regulation (EC) No 1059/2003 of the European Parliament and of the Council ▌ The reports shall be accompanied by a description of the method and data sources used to calculate the level of emissions. That method shall take into account soil characteristics, climate and expected raw material yields.

3. I the case of territories outside the Union, reports equivalent to those referred to in paragraph 2 and drawn up by competent bodies, may be reported to the Commission.

4. The Commission may decide, by means of an implementing act adopted in accordance with the examination procedure referred to in Article 31(3), that the reports referred to in paragraphs 2 and 3 of this Article contain accurate data for the purposes of measuring the greenhouse gas emissions associated with the cultivation of agriculture biomass feedstocks produced in the areas included in such reports for the purposes of Article 26(7). These data may therefore be used instead of the disaggregated default values for cultivation laid down in part D or E of Annex V for biofuels and bioliquids and in Part C of Annex VI for biomass fuels.

5. The Commission shall keep Annex V and Annex VI under review, with a view, where justified, to add ing or revising values for biofuel , bioliquid and biomass fuel production pathways . That review shall also consider the modification of the methodology laid down in part C of Annex V and in part B of Annex VI ▌.

In the event that the Commission's review concludes that changes to Annex V or Annex VI should be made, the Commission is empowered to adopt delegated acts pursuant to Article 32.

In the case of any adaptation of or addition to the list of default values in Annex V and Annex VI:

(a) where the contribution of a factor to overall emissions is small, or where there is limited variation, or where the cost or difficulty of establishing actual values is high, default values shall be typical of normal production processes;

(b) ***in all other cases default values must be conservative compared to normal production processes.***

6. Where necessary in order to ensure the uniform application of Part C of Annex V and Part B of Annex VI, the Commission may adopt implementing acts setting out detailed technical specifications including definitions , conversion factors, calculation of annual cultivation emissions and/ or emission savings caused by changes above and below-ground carbon stocks on already cultivated land, calculation of emission savings from carbon capture, carbon replacement and carbon geological storage. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 31(3).

Article 29

Implementing measures

The implementing measures referred to in the second subparagraph of Article 26(2) and (6) ▌, Article 27 (6), ▌ the first subparagraph of Article 28(5) and Article 28(6) , shall also take full account of the purposes of Article 7a of Directive 98/70/EC[1].

Article 30

Monitoring by the Commission

1. The Commission shall monitor the origin of biofuels, bioliquids and biomass fuels consumed in the Union and the impact of their production, including impact as a result of displacement, on land use in the Union and the main third countries of supply. Such monitoring shall be based on Member States' integrated national energy and climate plans and corresponding progress reports required in Articles 3, 15 and 18 of Regulation [Governance], , and those of relevant third countries, intergovernmental organisations, scientific studies and any other relevant pieces of information. The Commission shall also monitor the commodity price changes associated with the use of biomass for energy and any associated positive and negative effects on food security.

2. The Commission shall maintain a dialogue and exchange information with third countries and biofuel, bioliquid and biomass fuel producers, consumer organisations and civil society concerning the general implementation of the measures in this Directive relating to biofuels, ***bioliquidsand*** biomass fuels . It shall, within that framework, pay particular attention to the impact that biofuel and bioliquid production may have on food prices.

[1] Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC (OJ L 350, 28.12.1998, p. 58).

3. In 2026, the Commission shall present a legislative proposal on the regulatory framework for the promotion of renewable energy for the post-2030 period.

This proposal shall take into account the experience of the implementation of this Directive , including its sustainability and greenhouse gas saving criteria, and technological developments in energy from renewable sources.

4. In 2032, the Commission shall present a report reviewing the application of this Directive.

Article 31

Committee procedure

1. The Commission shall be assisted by the Energy Union Committee. That committee shall be a committee within the meaning of Regulation (EU) No 182/2011 and work in the respective sectorial formations relevant for this Regulation .

2. For matters relating to the sustainability of biofuels, bioliquids and biomass fuels, the Commission shall be assisted by the Committee on the Sustainability of Biofuels, Bioliquids and Biomass fuels. That committee shall be a committee within the meaning of Regulation (EU) No 182/2011.

3. Where reference is made to this paragraph, Article 5 of Regulation (EU) No 182/2011 shall apply.

Where the Committee delivers no opinion, the Commission shall not adopt the draft implementing act and the third subparagraph of Article 5(4) of Regulation (EU) No 182/2011 shall apply.

Article 32

Exercise of the delegation

1. The power to adopt delegated acts is conferred on the Commission subject to the conditions laid down in this Article.

2. ***The power to adopt delegated acts referred to in Articles 7(3), 8(3), 25(1), 25(2), 25(7), 25(8) and 28(5) shall be conferred on the Commission for a period of five years from the entry into force of the Directive. The Commission shall draw up a report in respect of the delegation of power not later than nine months before the end of the 5 year period. The delegation of power shall be tacitly extended for periods of an identical duration, unless the European Parliament or the Council opposes such extension not later than three months before the end of each period.***

3. The power to adopt delegated acts referred to in Articles 7(***3***) shall be conferred on the Commission for a period of ***two*** years from ***the entry into force of this directive*** .

4. The delegation of power referred to in Articles 7(***3***), ***8(3***), 25(***1), 25(2), 25(7), 25(8***) and 28(5) may be revoked at any time by the European Parliament or by the Council. A decision of revocation shall put an end to the delegation of the power specified in that decision. It shall take effect the day following the publication of the decision in the Official Journal of the European Union or at a later date specified therein. It shall not affect the validity of any delegated acts already in force.

5. Before adopting a delegated act, the Commission shall consult experts designated by each Member State in accordance with the principles laid down in the Interinstitutional Agreement of 13 April 2016 on Better Law-Making.

6. As soon as it adopts a delegated act, the Commission shall notify it simultaneously to the European Parliament and to the Council.

7. A delegated act adopted pursuant to Articles 7(***3***), ***8(3***), 25(***1), 25(2), 25(7), 25(8***) and 28(5) shall enter into force only if no objection has been expressed either by the European Parliament or the Council within a period of two months of notification of that act to the European Parliament and the Council or if, before the expiry of that period, the European Parliament and the Council have both informed the Commission that they will not object. That period shall be extended by two months at the initiative of the European Parliament or of the Council.

Article 33

Transposition

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 30 June 2021, at the latest. They shall immediately communicate the text of those measures to the Commission.

   When Member States adopt those measures, they shall contain a reference to this Directive or shall be accompanied by such a reference on the occasion of their official publication. They shall also include a statement that references in existing laws, regulations and administrative provisions to the Directives repealed by this Directive shall be construed as references to this Directive. Member States shall determine how such reference is to be made and how that statement is to be formulated.

2. Member States shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive.

3. The provisions of this Directive shall not affect the application of the derogations pursuant to de legislation on the Union energy internal market legislation for electrricity.

Article 34

Repeal

Directive 2009/28/EC, as amended by the Directives listed in Annex XI, Part A is repealed with effect from 1 ***July*** 2021, without prejudice to the obligations of the Member States relating to the time-limits for the transposition into national law of the Directives set out in Annex XI, Part B ***and without prejudice to the obligations of Member States in 2020 as set out in Article 3(1) and Part A of Annex I of Directive 2009/28/EC***.

References to the repealed Directive shall be construed as references to this Directive and shall be read in accordance with the correlation table in Annex XII.

Article 35

Entry into force

This Directive shall enter into force on ***the twentieth day following that of its publication in the Official Journal of the European Union.***

Article 36

Addressees

This Directive is addressed to the Member States.

Done at Brussels,

For the European Parliament	*For the Council*
The President	*The President*

ANNEX I

National overall targets for the share of energy from renewable sources in gross final consumption of energy in 2020[1]

A. National overall targets

	Share of energy from renewable sources in gross final consumption of energy, 2005 (S_{2005})	Target for share of energy from renewable sources in gross final consumption of energy, 2020 (S_{2020})
Belgium	2,2 %	13 %
Bulgaria	9,4 %	16 %
Czech Republic	6,1 %	13 %
Denmark	17,0 %	30 %
Germany	5,8 %	18 %
Estonia	18,0 %	25 %
Ireland	3,1 %	16 %
Greece	6,9 %	18 %
Spain	8,7 %	20 %
France	10,3 %	23 %
Croatia	12,6 %	20 %
Italy	5,2 %	17 %

[1] In order to be able to achieve the national objectives set out in this Annex, it is underlined that the State aid guidelines for environmental protection recognise the continued need for national mechanisms of support for the promotion of energy from renewable sources.

Cyprus	2,9 %	13 %
Latvia	32,6 %	40 %
Lithuania	15,0 %	23 %
Luxembourg	0,9 %	11 %
Hungary	4,3 %	13 %
Malta	0,0 %	10 %
Netherlands	2,4 %	14 %
Austria	23,3 %	34 %
Poland	7,2 %	15 %
Portugal	20,5 %	31 %
Romania	17,8 %	24 %
Slovenia	16,0 %	25 %
Slovak Republic	6,7 %	14 %
Finland	28,5 %	38 %
Sweden	39,8 %	49 %
United Kingdom	1,3 %	15 %

ANNEX II

Normalisation rule for accounting for electricity generated from hydropower and wind power

The following rule shall be applied for the purpose of accounting for electricity generated from hydropower in a given Member State:

$(Q_{N(norm)})(C_N[(/(i)(N 14))(Q_iC_i)] 15)$where:

N	=	reference year;
$Q_{N(norm)}$	=	normalised electricity generated by all hydropower plants of the Member State in year N, for accounting purposes;
Q_i	=	the quantity of electricity actually generated in year i by all hydropower plants of the Member State measured in GWh, excluding production from pumped storage units using water that has previously been pumped uphill;
C_i	=	the total installed capacity, net of pumped storage, of all hydropower plants of the Member State at the end of year i, measured in MW.

The following rule shall be applied for the purpose of accounting for electricity generated from ***onshore*** wind power in a given Member State:

$(Q_{N(norm)})((C_N\ C_{N\ 1}2)((/(i)(Nn))Q_i(/(j)(Nn))(C_j\ C_{j\ 1}2)))$where:

N	=	reference year;
$Q_{N(norm)}$	=	normalised electricity generated by all ***onshore*** wind power plants of the Member State in year N, for accounting purposes;
Q_i	=	the quantity of electricity actually generated in year i by all ***onshore*** wind power plants of the Member State measured in GWh;
C_j	=	the total installed capacity of all the ***onshore*** wind power plants of the Member State at the end of year j, measured in MW;
n	=	4 or the number of years preceding year N for which capacity and production data are available for the Member State in question, whichever is lower.

The following rule shall be applied for the purpose of accounting for electricity generated from offshore wind power in a given Member State:

($Q_{N(norm)}$)((C_N $C_{N\ 1}$2)((/(i)(Nn))Q_i(/(j)(Nn))(C_j $C_{j\ 1}$2)))where:

N	**=**	***reference year;***
$Q_{N(norm)}$	**=**	***normalised electricity generated by all offshore wind power plants of the Member State in year N, for accounting purposes;***
Q_i	**=**	***the quantity of electricity actually generated in year i by all offshore wind power plants of the Member State measured in GWh;***
C_j	**=**	***the total installed capacity of all the offshore wind power plants of the Member State at the end of year j, measured in MW;***
n	**=**	***4 or the number of years preceding year N for which capacity and production data are available for the Member State in question, whichever is lower.***

ANNEX III

Energy content of fuels

Fuel	Energy content by weight (lower calorific value, MJ/kg)	Energy content by volume (lower calorific value, MJ/l)
FUELS FROM BIOMASS AND/ OR BIOMASS PROCESSING OPERATIONS		
Bio-Propane	46	24
Pure vegetable oil (oil produced from oil plants through pressing, extraction or comparable procedures, crude or refined but chemically unmodified)	37	34
Biodiesel - fatty acid methyl ester (methyl-ester produced from oil of biomass origin)	37	33
Biodiesel - fatty acid ethyl ester (ethyl-ester produced from oil of biomass origin)	38	34
Biogas that can be purified to natural gas quality	50	-
Hydrotreated (thermochemically treated with hydrogen) oil of biomass origin, to be used for replacement of diesel	44	34
Hydrotreated (thermochemically treated with hydrogen) oil of biomass origin, to be used for replacement of petrol	45	30
Hydrotreated (thermochemically treated with hydrogen) oil of biomass origin, to be used for replacement of jet fuel	44	34
Hydrotreated oil (thermochemically treated with hydrogen) of biomass origin, to be used for replacement of liquefied petroleum gas	46	24

Fuel	Energy content by weight (lower calorific value, MJ/kg)	Energy content by volume (lower calorific value, MJ/l)
Co-processed oil (processed in a refinery simultaneously with fossil fuel) of biomass or pyrolysed biomass origin to be used for replacement of diesel	43	36
Co-processed oil (processed in a refinery simultaneously with fossil fuel) of biomass or pyrolysed biomass origin, to be used to replace petrol	44	32
Co-processed oil (processed in a refinery simultaneously with fossil fuel) of biomass or pyrolysed biomass origin, to be used to replace jet fuel	43	33
Co-processed oil (processed in a refinery simultaneously with fossil fuel) of biomass or pyrolysed biomass origin, to be used to replace liquefied petroleum gas	46	23
RENEWABLE FUELS THAT CAN BE PRODUCED FROM VARIOUS RENEWABLE ENERGY SOURCES INCLUDING WHILE NOT LIMITED TO BIOMASS		
Methanol from renewable energy sources	20	16
Ethanol from renewable energy sources	27	21
Propanol from renewable energy sources	31	25
Butanol from renewable energy sources	33	27
Fischer-Tropsch diesel (a synthetic hydrocarbon or mixture of synthetic hydrocarbons to be used for replacement of diesel)	44	34
Fischer-Tropsch petrol (a synthetic hydrocarbon or mixture of synthetic hydrocarbons produced from biomass, to be used for replacement of petrol)	44	33
Fischer-Tropsch jet fuel (a synthetic hydrocarbon or mixture of synthetic hydrocarbons produced from biomass, to be used for replacement of jet fuel)	44	33
Fischer-Tropsch liquefied petroleum gas (a synthetic hydrocarbon or mixture of synthetic hydrocarbons, to be used for replacement of liquefied petroleum gas	46	24

Fuel	Energy content by weight (lower calorific value, MJ/kg)	Energy content by volume (lower calorific value, MJ/l)
DME (dimethylether)	28	19
Hydrogen from renewable sources	120	-
ETBE (ethyl-tertio-butyl-ether produced on the basis of ethanol)	36 (of which 37 % from renewable sources)	27 (of which 37 % from renewable sources)
MTBE (methyl-tertio-butyl-ether produced on the basis of methanol)	35 (of which 22 % from renewable sources)	26 (of which 22 % from renewable sources)
TAEE (tertiary-amyl-ethyl-ether produced on the basis of ethanol)	38 (of which 29 % from renewable sources)	29 (of which 29 % from renewable sources)
TAME (tertiary-amyl-methyl-ether produced on the basis of ethanol)	36 (of which 18 % from renewable sources)	28 (of which 18 % from renewable sources)
THxEE (tertiary-hexyl-ethyl-ether produced on the basis of ethanol)	38 (of which 25 % from renewable sources)	30 (of which 25 % from renewable sources)
THxME (tertiary-hexyl-methyl-ether produced on the basis of ethanol)	38 of which 14 % from renewable sources)	30 (of which 14 % from renewable sources)
FOSSIL FUELS		
Petrol	43	32
Diesel	43	36

ANNEX IV

Certification of installers

The certification schemes or equivalent qualification schemes referred to in Article 18 (3) shall be based on the following criteria:

1. The certification or qualification process shall be transparent and clearly defined by the Member State or the administrative body they appoint.

2. Biomass, heat pump, shallow geothermal and solar photovoltaic and solar thermal installers shall be certified by an accredited training programme or training provider.

3. The accreditation of the training programme or provider shall be effected by Member States or administrative bodies they appoint. The accrediting body shall ensure that the training programme offered by the training provider has continuity and regional or national coverage. The training provider shall have adequate technical facilities to provide practical training, including some laboratory equipment or corresponding facilities to provide practical training. The training provider shall also offer in addition to the basic training, shorter refresher courses on topical issues, including on new technologies, to enable life-long learning in installations. The training provider may be the manufacturer of the equipment or system, institutes or associations.

4. The training leading to installer certification or qualification shall include both theoretical and practical parts. At the end of the training, the installer must have the skills required to install the relevant equipment and systems to meet the performance and reliability needs of the customer, incorporate quality craftsmanship, and comply with all applicable codes and standards, including energy and eco-labelling.

5. The training course shall end with an examination leading to a certificate or qualification. The examination shall include a practical assessment of successfully installing biomass boilers or stoves, heat pumps, shallow geothermal installations, solar photovoltaic or solar thermal installations.

6. The certification schemes or equivalent qualification schemes referred to in Article 18 (3) shall take due account of the following guidelines:

(a) Accredited training programmes should be offered to installers with work experience, who have undergone, or are undergoing, the following types of training:

(i) in the case of biomass boiler and stove installers: training as a plumber, pipe fitter, heating engineer or technician of sanitary and heating or cooling equipment as a prerequisite;

(ii) in the case of heat pump installers: training as a plumber or refrigeration engineer and have basic electrical and plumbing skills (cutting pipe, soldering pipe joints, gluing pipe joints, lagging, sealing fittings, testing for leaks and installation of heating or cooling systems) as a prerequisite;

(iii) in the case of a solar photovoltaic or solar thermal installer: training as a plumber or electrician and have plumbing, electrical and roofing skills, including knowledge of soldering pipe joints, gluing pipe joints, sealing fittings, testing for plumbing leaks, ability to connect wiring, familiar with basic roof materials, flashing and sealing methods as a prerequisite; or

(iv) a vocational training scheme to provide an installer with adequate skills corresponding to a three years education in the skills referred to in point (a), (b) or (c) including both classroom and workplace learning.

(b) The theoretical part of the biomass stove and boiler installer training should give an overview of the market situation of biomass and cover ecological aspects, biomass fuels, logistics, fire protection, related subsidies, combustion techniques, firing systems, optimal hydraulic solutions, cost and profitability comparison as well as the design, installation, and maintenance of biomass boilers and stoves. The training should also provide good knowledge of any European standards for technology and biomass fuels, such as pellets, and biomass related national and Community law.

(c) The theoretical part of the heat pump installer training should give an overview of the market situation for heat pumps and cover geothermal resources and ground source temperatures of different regions, soil and rock identification for thermal conductivity, regulations on using geothermal resources, feasibility of using heat pumps in buildings and determining the most suitable heat pump system, and knowledge about their technical requirements, safety, air filtering, connection with the heat source and system layout. The training should also provide good knowledge of any European standards for heat pumps, and of relevant national and Community law. The installer should demonstrate the following key competences:

(i) a basic understanding of the physical and operation principles of a heat pump, including characteristics of the heat pump circle: context between low temperatures of the heat sink, high temperatures of the heat source, and the efficiency of the system, determination of the coefficient of performance (COP) and seasonal performance factor (SPF);

(ii) an understanding of the components and their function within a heat pump circle, including the compressor, expansion valve, evaporator, condenser, fixtures and fittings, lubricating oil, refrigerant, superheating and sub-cooling and cooling possibilities with heat pumps; and

(iii) the ability to choose and size the components in typical installation situations, including determining the typical values of the heat load of different buildings and for hot water production based on energy consumption, determining the capacity of the heat pump on the heat load for hot water production, on the storage mass of the building and on interruptible current supply; determine buffer tank component and its volume and integration of a second heating system.

(d) The theoretical part of the solar photovoltaic and solar thermal installer training should give an overview of the market situation of solar products and cost and profitability comparisons, and cover ecological aspects, components, characteristics and dimensioning of solar systems, selection of accurate systems and dimensioning of components, determination of the heat demand, fire protection, related subsidies, as well as the design, installation, and maintenance of solar photovoltaic and solar thermal installations. The training should also provide good knowledge of any European standards for technology, and certification such as Solar Keymark, and related national and Community law. The installer should demonstrate the following key competences:

(i) the ability to work safely using the required tools and equipment and implementing safety codes and standards and identify plumbing, electrical and other hazards associated with solar installations;

(ii) the ability to identify systems and their components specific to active and passive systems, including the mechanical design, and determine the components' location and system layout and configuration;

(iii) the ability to determine the required installation area, orientation and tilt for the solar photovoltaic and solar water heater, taking account of shading, solar access, structural integrity, the appropriateness of the installation for the building or the climate and identify different installation methods suitable for roof types and the balance of system equipment required for the installation; and

(iv) for solar photovoltaic systems in particular, the ability to adapt the electrical design, including determining design currents, selecting appropriate conductor types and ratings for each electrical circuit, determining appropriate size, ratings and locations for all associated equipment and subsystems and selecting an appropriate interconnection point.

(e) The installer certification should be time restricted, so that a refresher seminar or event would be necessary for continued certification.

ANNEX V

Rules for calculating the greenhouse gas impact of biofuels, bioliquids and their fossil fuel comparators

A. TYPICAL AND DEFAULT VALUES FOR BIOFUELS IF PRODUCED WITH NO NET CARBON EMISSIONS FROM LAND-USE CHANGE

Biofuel production pathway	Typical greenhouse gas emission saving	Default greenhouse gas emission saving
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	67 %	59 %
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	77 %	73%
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant*)	73 %	68 %
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant*)	79 %	76 %
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant *)	58 %	***47*** %
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant *)	71 %	64 %
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	***48*** %	40 %
corn (maize) ethanol, (natural gas as process fuel in CHP plant *)	55 %	48 %
corn (maize) ethanol (lignite as process fuel in CHP plant*)	40 %	28 %
corn (maize) ethanol (forest residues as process fuel in CHP plant*)	69 %	68 %

Biofuel production pathway	Typical greenhouse gas emission saving	Default greenhouse gas emission saving
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	47 %	38 %
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant *)	53 %	46 %
other cereals excluding maize ethanol (lignite as process fuel in CHP plant *)	37 %	24 %
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant *)	67 %	67 %
sugar cane ethanol	70 %	70 %
the part from renewable sources of ethyl-tertio-butyl-ether (ETBE)	Equal to that of the ethanol production pathway used	
the part from renewable sources of tertiary-amyl-ethyl-ether (TAEE)	Equal to that of the ethanol production pathway used	
rape seed biodiesel	52 %	47 %
sunflower biodiesel	57 %	52 %
soybean biodiesel	55 %	50 %
palm oil biodiesel (open effluent pond)	***32*** %	***19*** %
palm oil biodiesel (process with methane capture at oil mill)	***51*** %	***45*** %
waste cooking oil biodiesel	***88*** %	***84*** %
animal fats from rendering biodiesel **	***84*** %	***78*** %
hydrotreated vegetable oil from rape seed	51 %	47 %
hydrotreated vegetable oil from sunflower	58 %	54 %
hydrotreated vegetable oil from soybean	55 %	51 %
hydrotreated vegetable oil from palm oil (open effluent pond)	***34*** %	***22*** %
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	***53*** %	***49*** %
hydrotreated oil from waste cooking oil	***87*** %	***83*** %

Biofuel production pathway	Typical greenhouse gas emission saving	Default greenhouse gas emission saving
hydrotreated oil from animal fats from rendering **	***83*** %	***77*** %
pure vegetable oil from rape seed	59 %	57 %
pure vegetable oil from sunflower	65 %	64 %
pure vegetable oil from soybean	***63*** %	61 %
pure vegetable oil from palm oil (open effluent pond)	***40*** %	***30*** %
pure vegetable oil from palm oil (process with methane capture at oil mill)	***59*** %	***57*** %
pure oil from waste cooking oil	98 %	98 %
		▌

(***) ***Applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption for which emissions related to hygenisation as part of the rendering are not considered***

(*) Default values for processes using CHP are valid only if ALL the process heat is supplied by CHP.

B. ESTIMATED TYPICAL AND DEFAULT VALUES FOR FUTURE BIOFUELS THAT WERE NOT ON THE MARKET OR WERE ON THE MARKET ONLY IN NEGLIGIBLE QUANTITIES IN 2016, IF PRODUCED WITH NO NET CARBON EMISSIONS FROM LAND-USE CHANGE

Biofuel production pathway	Typical greenhouse gas emission saving	Default greenhouse gas emission saving
wheat straw ethanol	85 %	83 %
waste wood Fischer-Tropsch diesel in free-standing plant	85 %	85 %
farmed wood Fischer-Tropsch diesel in free-standing plant	***82*** %	***82*** %
waste wood Fischer-Tropsch petrol in free-standing plant	85 %	85 %
farmed wood Fischer-Tropsch petrol in free-standing plant	***82*** %	***82*** %
waste wood dimethylether (DME) in free-standing plant	86 %	86 %
farmed wood dimethylether (DME) in free-standing plant	***83*** %	***83*** %
waste wood methanol in free-standing plant	86 %	86 %
farmed wood methanol in free-standing plant	***83*** %	***83*** %
Fischer – Tropsch diesel from black-liquor gasification integrated with pulp mill	89 %	89 %
Fischer – Tropsch petrol from black-liquor gasification integrated with pulp mill	89 %	89 %
dimethylether DME from black-liquor gasification integrated with pulp mill	89 %	89 %
Methanol from black-liquor gasification integrated with pulp mill	89 %	89 %
the part from renewable sources of methyl-tertio-butyl-ether (MTBE)	Equal to that of the methanol production pathway used	

C. METHODOLOGY

1. Greenhouse gas emissions from the production and use of transport fuels, biofuels and bioliquids shall be calculated as follows :

(a) greenhouse gas emissions from the production and use of biofuels shall be calculated as:

$$E = e_{ec} + e_{l} + e_{p} + e_{td} + e_{u} - e_{sca} - e_{ccs} - e_{ccr} ,$$

where

E	=	total emissions from the use of the fuel;
e_{ec}	=	emissions from the extraction or cultivation of raw materials;
e_{l}	=	annualised emissions from carbon stock changes caused by land-use change;
e_{p}	=	emissions from processing;
e_{td}	=	emissions from transport and distribution;
e_{u}	=	emissions from the fuel in use;
e_{sca}	=	emission savings from soil carbon accumulation via improved agricultural management;
e_{ccs}	=	emission savings from carbon capture and geological storage; and
e_{ccr}	=	emission saving from carbon capture and replacement.

Emissions from the manufacture of machinery and equipment shall not be taken into account.

(b) Greenhouse gas emissions from the production and use of bioliquids shall be calculated as for biofuels (E), but with the extension necessary for including the energy conversion to electricity and/or heat and cooling produced, as follows:

(i) Energy installations delivering only heat:

$$EC_h = \frac{E}{\eta_h}$$

(ii) For energy installations delivering only electricity:

$$EC_{el} = \frac{E}{\eta_{el}}$$

where

$EC_{h,el}$ = Total greenhouse gas emissions from the final energy commodity.

E =Total greenhouse gas emissions of the bioliquid before end-conversion.

η_{el} = The electrical efficiency, defined as the annual electricity produced divided by the annual bioliquid input based on its energy content.

η_h = The heat efficiency, defined as the annual useful heat output divided by the annual bioliquid input based on its energy content.

(iii) For the electricity or mechanical energy coming from energy installations delivering useful heat together with electricity and/or mechanical energy:

$$EC_{el} = \frac{E}{\eta_{el}} \left(\frac{C_{el} \cdot \eta_{el}}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

(iv) For the useful heat coming from energy installations delivering heat together with electricity and/or mechanical energy:

$$EC_h = \frac{E}{\eta_h} \left(\frac{C_h \cdot \eta_h}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

where:

$EC_{h,el}$ = Total greenhouse gas emissions from the final energy commodity.

E =Total greenhouse gas emissions of the bioliquid before end-conversion.

η_{el} = The electrical efficiency, defined as the annual electricity produced divided by the annual fuel input based on its energy content.

η_h = The heat efficiency, defined as the annual useful heat output divided by the annual fuel input based on its energy content.

C_{el} = Fraction of exergy in the electricity, and/or mechanical energy, set to 100 % ($C_{el} = 1$).

C_h = Carnot efficiency (fraction of exergy in the useful heat).

The Carnot efficiency, C_h , for useful heat at different temperatures is defined as:

$$C_h = \frac{T_h - T_0}{T_h}$$

where

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at point of delivery.

T_0 = Temperature of surroundings, set at 273 kelvin (equal to 0 °C)

If the excess heat is exported for heating of buildings, at a temperature below 150 °C (423.15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423.15 kelvin), which is: 0.3546

For the purposes of this calculation, the following definitions shall apply:

(a) "cogeneration" shall mean the simultaneous generation in one process of thermal energy and electricity and/or mechanical energy;

(b) "useful heat" shall mean heat generated to satisfy an economical justifiable demand for heat, for heating and cooling purposes;

(c) "economically justifiable demand" shall mean the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions.

2. Greenhouse gas emissions from biofuels and bioliquids shall be expressed as follows:

(a) greenhouse gas emissions from biofuels, E, shall be expressed in terms of grams of CO_2 equivalent per MJ of fuel, gCO_{2eq} /MJ.

(b) greenhouse gas emissions from bioliquids, EC, in terms of grams of CO_2 equivalent per MJ of final energy commodity (heat or electricity), gCO_{2eq} /MJ.

When heating and cooling are co-generated with electricity emissions shall be allocated between heat and electricity (as under 1(b)) irrespective if the heat is used for actual heating purposes or for cooling[1].

Where the greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} are expressed in unit g CO_{2eq}/dry-ton of feedstock the conversion to grams of CO_2 equivalent per MJ of fuel, gCO_{2eq} /MJ shall be calculated as follows[2];

$$e_{ec}fuel_a\left[\frac{gCO_2eq}{MJ\ fuel}\right]_{ec} = \frac{e_{ec}\ feedstock_a\left[\frac{gCO_2eq}{t_{dry}}\right]}{LHV_a\left[\frac{MJ\ feedstock}{t\ dry\ feedstock}\right]} * Fuel\ feedstock\ factor_a * Allocation\ factor\ fuel_a$$

where

$$Allocation\ factor\ fuel_a = \left[\frac{Energy\ in\ fuel}{Energy\ fuel + Energy\ in\ co-products}\right]$$

$$Fuel\ feedstock\ factor_a = [Ratio\ of\ MJ\ feedstock\ required\ to\ make\ 1\ MJ\ fuel]$$

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1 Heat or waste heat is used to generate cooling (chilled air or water) through absorption chillers. Therefore, it is appropriate to calculate only the emissions associated to the heat produced per MJ of heat, irrespectively if the end-use of the heat is actual heating or cooling via absorption chillers.

2 ***The formula for calculating greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} describes cases where feedstock is converted into biofuels in one step. For more complex supply chains, adjustments are needed for calculating greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} for intermediate products.***

Emissions per dry-ton feedstock shall be calculated as follows:

$$e_{ec}feedstock_a\left[\frac{gCO_2eq}{t_{dry}}\right] = \frac{e_{ec}\ feedstock_a\left[\frac{gCO_2eq}{t_{moist}}\right]}{(1-moisture\ content)}$$

3. Greenhouse gas emission savings from biofuels and bioliquids shall be calculated as follows:

(a) greenhouse gas emission savings from biofuels:

SAVING = $(E_{F(t)} - E_B)/E_{F(t)}$,

where

E_B	=	total emissions from the biofuel; and
$E_{F(t)}$	=	total emissions from the fossil fuel comparator for transport

(b) greenhouse gas emission savings from heat and cooling, and electricity being generated from bioliquids:

SAVING = $(EC_{F(h\&c,el,)} - EC_{B(h\&c,el)})/EC_{F\ (h\&c,el)}$,

where

$EC_{B(h\&c,el)}$ = total emissions from the heat or electricity; and

$EC_{F(h\&c,el)}$ = total emissions from the fossil fuel comparator for useful heat or electricity.

4. The greenhouse gases taken into account for the purposes of point 1 shall be CO_2, N_2O and CH_4. For the purpose of calculating CO_2 equivalence, those gases shall be valued as follows:

CO_2	:	1
N_2O	:	***298***
CH_4	:	***25***

5. Emissions from the extraction or cultivation of raw materials, e_{ec}, shall include emissions from the extraction or cultivation process itself; from the collection, drying and storage of raw materials; from waste and leakages; and from the production of chemicals or products used in extraction or cultivation. Capture of CO_2 in the cultivation of raw materials shall be excluded. Estimates of emissions from agriculture biomass cultivation may be derived from the use of regional averages for cultivation emissions included in the reports referred to in Article 28 (4) ***or*** the information on the disaggregated default values for cultivation emissions included in this Annex, as an alternative to using actual values. In absence of relevant information in the before mentioned reports it is allowed to calculate averages based on local farming practises based for instance on data of a group of farms , as an alternative to using actual values.

6. For the purposes of the calculation referred to in point ***1, sub-point (a),*** emission savings from improved agriculture management e_{sca}, such as shifting to reduced or zero-tillage, improved crop/rotation, the use of cover crops, including crop residue management, and the use of organic soil improver (e.g. compost, manure fermentation digestate), shall be taken into account only if solid and verifiable evidence is provided that the soil carbon has increased or that it is reasonable to expect to have increased over the period in which the raw materials concerned were cultivated while taking into account the emissions where such practices lead to increased fertiliser and herbicide use[1].

7. Annualised emissions from carbon stock changes caused by land-use change, e_l, shall be calculated by dividing total emissions equally over 20 years. For the calculation of those emissions, the following rule shall be applied:

$e_l = (CS_R – CS_A) \times 3{,}664 \times 1/20 \times 1/P – e_B$,[2]

[1] ***Measurements of soil carbon can constitute such evidence, e.g. by a first measurement in advance of the cultivation and subsequent ones at regular intervals several years apart. In such case, before the second measurement is available, increase in soil carbon would be estimated on the basis of representative experiments or soil models. From the second measurement onwards, the measurements would constitute the basis for determining the existence of an increase in soil carbon and its magnitude.***

[2] The quotient obtained by dividing the molecular weight of CO_2 (44,010 g/mol) by the molecular weight of carbon (12,011 g/mol) is equal to 3,664.

where

e_l	=	annualised greenhouse gas emissions from carbon stock change due to land-use change (measured as mass (grams) of CO_2-equivalent per unit of biofuel or bioliquid energy (megajoules)). 'Cropland'[1] and 'perennial cropland'[2] shall be regarded as one land use;
CS_R	=	the carbon stock per unit area associated with the reference land-use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). The reference land-use shall be the land-use in January 2008 or 20 years before the raw material was obtained, whichever was the later;
CS_A	=	the carbon stock per unit area associated with the actual land-use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). In cases where the carbon stock accumulates over more than one year, the value attributed to CS_A shall be the estimated stock per unit area after 20 years or when the crop reaches maturity, whichever the earlier;
P	=	the productivity of the crop (measured as biofuel or bioliquid energy per unit area per year) and
e_B	=	bonus of 29 gCO_{2eq}/MJ biofuel or bioliquid if biomass is obtained from restored degraded land under the conditions provided for in point 8.

[1] Cropland as defined by IPCC.

[2] Perennial crops are defined as multi-annual crops, the stem of which is usually not annually harvested such as short rotation coppice and oil palm.

8. The bonus of 29 gCO_{2eq}/MJ shall be attributed if evidence is provided that the land:

(a) was not in use for agriculture or any other activity in January 2008; and

(b) is severely degraded land, including such land that was formerly in agricultural use.

The bonus of 29 gCO_{2eq}/MJ shall apply for a period of up to 20 years from the date of conversion of the land to agricultural use, provided that a steady increase in carbon stocks as well as a sizable reduction in erosion phenomena for land falling under (b) are ensured .

9. Severely degraded land' means land that, for a significant period of time, has either been significantly salinated or presented significantly low organic matter content and has been severely eroded;

10. The Commission shall review , by 31 December 2020 , guidelines for the calculation of land carbon stocks[1] drawing on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories — volume 4 and in accordance with the Regulation (EU) No 525/2013[2] and the Regulation (INSERT THE NO AFTER THE ADOPTION[3]) . The Commission guidelines shall serve as the basis for the calculation of land carbon stocks for the purposes of this Directive.

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1 Commission Decision 2010/335/EU of 10 June 2010 on guidelines for the calculation of land carbon stocks for the purpose of Annex V to Directive 2009/28/EC (OJ L 151, 17.6.2010, p. 19).

2 Regulation (EU) 525/2013 of the European Parliament and of the Council of 21 may 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC (OJ L 165, 18.6.2013, p. 13).

3 Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (OJ L 156, 19.6.2018, p. 1).

11. Emissions from processing, e_p, shall include emissions from the processing itself; from waste and leakages; and from the production of chemicals or products used in processing ***including the carbon dioxide emissions corresponding to the carbon contents of fossil inputs, whether or not actually combusted in the process***.

In accounting for the consumption of electricity not produced within the fuel production plant, the greenhouse gas emission intensity of the production and distribution of that electricity shall be assumed to be equal to the average emission intensity of the production and distribution of electricity in a defined region. By derogation from this rule, producers may use an average value for an individual electricity production plant for electricity produced by that plant, if that plant is not connected to the electricity grid.

Emissions from processing shall include emissions from drying of interim – products and materials where relevant.

12. Emissions from transport and distribution, e_{td}, shall include emissions from the transport of raw and semi-finished materials and from the storage and distribution of finished materials. Emissions from transport and distribution to be taken into account under point 5 shall not be covered by this point.

13. Emissions of the fuel in use, e_u, shall be taken to be zero for biofuels and bioliquids.

Emissions on non-CO_2 greenhouse gases (N_2O and CH_4) of the fuel in use shall be included in the e_u factor for bioliquids.

14. Emission saving from carbon capture and geological storage e_{ccs}, that have not already been accounted for in e_p, shall be limited to emissions avoided through the capture and storage of emitted CO_2 directly related to the extraction, transport, processing and distribution of fuel if stored in compliance with Directive 2009/31/EC on the geological storage of carbon dioxide .

15. Emission saving from carbon capture and replacement, e_{ccr} , shall be related directly to the production of biofuel or bioliquid they are attributed to, and shall be limited to emissions avoided through the capture of CO_2 of which the carbon originates from biomass and which is used ***to replace fossil-derived CO_2 in production of commercial products and services***.

16. Where a cogeneration unit – providing heat and/ or electricity to a fuel production process for which emissions are being calculated – produces excess electricity and/or excess useful heat, the greenhouse gas emissions shall be divided between the electricity and the useful heat according to the temperature of the heat (which reflects the usefulness (utility) of the heat). The ***useful part of the heat is found by multiplying its energy content with the*** Carnot efficiency C_h , ▌ calculated as follows ▌:

$$C_h = \frac{T_h - T_0}{T_h}$$

where

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at point of delivery.

T_0 = Temperature of surroundings, set at 273 kelvin (equal to 0°C)

If the excess heat is exported for heating of buildings, at a temperature below 150°C (423.15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423.15 kelvin), which is: 0.3546

For the purposes of this calculation, the actual efficiencies shall be used, defined as the annual mechanical energy, electricity and heat produced respectively divided by the annual energy input.

For the purposes of this calculation, the following definitions shall apply:

(a) "cogeneration" shall mean the simultaneous generation in one process of thermal energy and electrical and/or mechanical energy;

(b) "useful heat" shall mean heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes;

(c) "economically justifiable demand" shall mean the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions.

17. Where a fuel production process produces, in combination, the fuel for which emissions are being calculated and one or more other products (co-products), greenhouse gas emissions shall be divided between the fuel or its intermediate product and the co-products in proportion to their energy content (determined by lower heating value in the case of co-products other than electricity and heat). The greenhouse gas intensity of excess useful heat or excess electricity is the same as the greenhouse gas intensity of heat or electricity delivered to the fuel production process and is determined from calculating the greenhouse intensity of all inputs and emissions, including the feedstock and CH_4 and N_2O emissions, to and from the cogeneration unit, boiler or other apparatus delivering heat or electricity to the fuel production process. In case of cogeneration of electricity and heat the calculation is performed following point 16.

18. For the purposes of the calculation referred to in point 17, the emissions to be divided shall be $e_{ec} + e_{l} + e_{sca}$ + those fractions of e_{p}, e_{td} , e_{ccs}, and e_{ccr} that take place up to and including the process step at which a co-product is produced. If any allocation to co-products has taken place at an earlier process step in the life-cycle, the fraction of those emissions assigned in the last such process step to the intermediate fuel product shall be used for this purpose instead of the total of those emissions.

In the case of biofuels and bioliquids, all co-products ▌**,** shall be taken into account for the purposes of that calculation. No emissions shall be allocated to wastes and residues. Co-products that have a negative energy content shall be considered to have an energy content of zero for the purpose of the calculation.

Wastes and residues, including tree tops and branches, straw, husks, cobs and nut shells, and residues from processing, including crude glycerine (glycerine that is not refined) and bagasse, shall be considered to have zero life-cycle greenhouse gas emissions up to the process of collection of those materials irrespectively of whether they are processed to interim products before being transformed into the final product.

In the case of fuels produced in refineries, other than the combination of processing plants with boilers or cogeneration units providing heat and/or electricity to the processing plant, the unit of analysis for the purposes of the calculation referred to in point 17 shall be the refinery.

19. For biofuels, for the purposes of the calculation referred to in point 3, the fossil fuel comparator $E_{F(t)}$ shall be 94 gCO_{2eq}/MJ.

For bioliquids used for electricity production, for the purposes of the calculation referred to in point 3, the fossil fuel comparator $\boldsymbol{EC_{F(e)}}$ shall be 183 gCO_{2eq}/MJ.

For bioliquids used for the production of useful heat , as well as for the production of heating and/or cooling , for the purposes of the calculation referred to in point 3, the fossil fuel comparator $\boldsymbol{EC_{F}}_{(h\&c)}$ shall be 80 gCO_{2eq}/MJ.

D. DISAGGREGATED DEFAULT VALUES FOR BIOFUELS AND BIOLIQUIDS

Disaggregated default values for cultivation: 'e_{ec}' as defined in part C of this Annex including soil N_2O emissions

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
sugar beet ethanol	9.6	9.6
corn (maize) ethanol	25.5	25.5
other cereals excluding corn (maize) ethanol	27.0	27.0
sugar cane ethanol	17.1	17.1
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	32.0	32.0
sunflower biodiesel	26.1	26.1
soybean biodiesel	***21.2***	***21.2***
palm oil biodiesel	***26.2***	***26.2***
waste cooking oil biodiesel	0	0
animal fats from rendering biodiesel**	0	0
hydrotreated vegetable oil from rape seed	33.4	33.4
hydrotreated vegetable oil from sunflower	26.9	26.9
hydrotreated vegetable oil from soybean	***22.1***	***22.1***
hydrotreated vegetable oil from palm oil	***27.4***	***27.4***

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
hydrotreated oil from waste cooking oil	0	0
hydrotreated oil from animal fats from rendering**	0	0
pure vegetable oil from rape seed	33.4	33.4
pure vegetable oil from sunflower	27.2	27.2
pure vegetable oil from soybean	***22.2***	***22.2***
pure vegetable oil from palm oil	***27.1***	***27.1***
pure oil from waste cooking oil	0	0

(**) ***Applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption for which emissions related to hygenisation as part of the rendering are not considered.***

Disaggregated default values for cultivation: 'e_{ec}' - for soil N_2O emissions only (these are already included in disaggregated values for cultivation emissions in 'e_{ec}' table)

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
sugar beet ethanol	4.9	4.9
corn (maize) ethanol	13.7	13.7
other cereals excluding corn (maize) ethanol	14.1	14.1
sugar cane ethanol	2.1	2.1
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	17.6	17.6
sunflower biodiesel	12.2	12.2
soybean biodiesel	13.4	13.4
palm oil biodiesel	16.5	16.5
waste cooking oil biodiesel	0	0
animal fats from rendering biodiesel**	0	0
hydrotreated vegetable oil from rape seed	18.0	18.0
hydrotreated vegetable oil from sunflower	12.5	12.5
hydrotreated vegetable oil from soybean	13.7	13.7
hydrotreated vegetable oil from palm oil	16.9	16.9

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
hydrotreated oil from waste cooking oil	0	0
hydrotreated oil from animal fats from rendering**	0	0
pure vegetable oil from rape seed	17.6	17.6
pure vegetable oil from sunflower	12.2	12.2
pure vegetable oil from soybean	13.4	13.4
pure vegetable oil from palm oil	16.5	16.5
pure oil from waste cooking oil	0	0

(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption for which emissions related to hygenisation as part of the rendering are not considered.

Disaggregated default values for processing : ‘ep ’ as defined in part C of this Annex

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	18.8	26.3
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	9.7	13.6
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant*)	13.2	18.5
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant*)	7.6	10.6
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant *)	27.4	38.3
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant *)	15.7	22.0
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	20.8	29.1
corn (maize) ethanol, (natural gas as process fuel in CHP plant*)	14.8	20.8
corn (maize) ethanol (lignite as process fuel in CHP plant*)	8.6	40.1
corn (maize) ethanol (forest residues as process fuel in CHP plant*)	1.8	2.6
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	21.0	29.3
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant*)	15.1	21.1

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
other cereals excluding maize ethanol (lignite as process fuel in CHP plant*)	30.3	42.5
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant*)	1.5	2.2
sugar cane ethanol	1.3	1.8
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	1.7	16.3
sunflower biodiesel	11.8	16.5
soybean biodiesel	12.1	16.9
palm oil biodiesel (open effluent pond)	30.4	42.6
palm oil biodiesel (process with methane capture at oil mill)	13.2	18.5
waste cooking oil biodiesel	***9.3***	***13.0***
animal fats from rendering biodiesel **	***13.6***	***19.1***
hydrotreated vegetable oil from rape seed	10.7	15.0
hydrotreated vegetable oil from sunflower	10.5	14.7
hydrotreated vegetable oil from soybean	10.9	15.2
hydrotreated vegetable oil from palm oil (open effluent pond)	27.8	38.9
hydrotreated vegetable oil from palm oil(process with methane capture at oil mill)	9.7	13.6
hydrotreated oil from waste cooking oil	***10.2***	***14.3***

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
hydrotreated oil from animal fats from rendering **	***14.5***	***20.3***
pure vegetable oil from rape seed	3.7	5.2
pure vegetable oil from sunflower	3.8	5.4
pure vegetable oil from soybean	4.2	5.9
pure vegetable oil from palm oil (open effluent pond)	22.6	31.7
pure vegetable oil from palm oil (process with methane capture at oil mill)	4.7	6.5
pure oil from waste cooking oil	0.6	0.8

(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption for which emissions related to hygenisation as part of the rendering are not considered.

Disaggregated default values for oil extraction only (these are already included in disaggregated values for processing emissions in 'e_p 'table)

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
rape seed biodiesel	3.0	4.2
sunflower biodiesel	2.9	4.0
soybean biodiesel	3.2	4.4
palm oil biodiesel (open effluent pond)	20.9	29.2
palm oil biodiesel (process with methane capture at oil mill)	3.7	5.1
waste cooking oil biodiesel	0	0
animal fats from rendering biodiesel **	4.3	***6.1***
hydrotreated vegetable oil from rape seed	3.1	4.4
hydrotreated vegetable oil from sunflower	3.0	4.1
hydrotreated vegetable oil from soybean	3.3	4.6
hydrotreated vegetable oil from palm oil (open effluent pond)	21.9	30.7
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	3.8	5.4
hydrotreated oil from waste cooking oil	0	0
hydrotreated oil from animal fats from rendering **	***4.3***	***6.0***

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
pure vegetable oil from rape seed	3.1	4.4
pure vegetable oil from sunflower	3.0	4.2
pure vegetable oil from soybean	3.4	4.7
pure vegetable oil from palm oil (open effluent pond)	21.8	30.5
pure vegetable oil from palm oil (process with methane capture at oil mill)	3.8	5.3
pure oil from waste cooking oil	0	0

(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption for which emissions related to hygenisation as part of the rendering are not considered.

Disaggregated default values for transport and distribution: 'e_{td}' as defined in part C of this Annex

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	***2.3***	***2.3***
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	***2.3***	***2.3***
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant*)	***2.3***	***2.3***
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant*)	***2.3***	***2.3***
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant *)	***2.3***	***2.3***
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant *)	***2.3***	***2.3***
corn (maize) ethanol (natural gas as process fuel in CHP plant*)	2.2	2.2
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	2.2	2.2
corn (maize) ethanol (lignite as process fuel in CHP plant*)	2.2	2.2
corn (maize) ethanol (forest residues as process fuel in CHP plant*)	2.2	2.2
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	2.2	2.2

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant *)	2.2	2.2
other cereals excluding maize ethanol (lignite as process fuel in CHP plant *)	2.2	2.2
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant *)	2.2	2.2
sugar cane ethanol	9.7	9.7
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	1.8	1.8
sunflower biodiesel	2.1	2.1
soybean biodiesel	8.9	8.9
palm oil biodiesel (open effluent pond)	6.9	6.9
palm oil biodiesel (process with methane capture at oil mill)	6.9	6.9
waste cooking oil biodiesel	1.9	1.9
animal fats from rendering biodiesel **	1.7	1.7
hydrotreated vegetable oil from rape seed	1.7	1.7
hydrotreated vegetable oil from sunflower	2.0	2.0
hydrotreated vegetable oil from soybean	***9.2***	***9.2***

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
hydrotreated vegetable oil from palm oil (open effluent pond)	7.0	7.0
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	7.0	7.0
hydrotreated oil from waste cooking oil	***1.7***	***1.7***
hydrotreated oil from animal fats from rendering ****	1.5	1.5
pure vegetable oil from rape seed	1.4	1.4
▌	▌	▌
▌	▌	▌
▌	▌	▌
▌	▌	▌
▌	▌	▌

(**) ***Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption for which emissions related to hygenisation as part of the rendering are not considered.***

pure vegetable oil from sunflower	***1.7***	***1.7***
pure vegetable oil from soybean	***8.8***	***8.8***
pure vegetable oil from palm oil (open effluent pond)	***6.7***	***6.7***
pure vegetable oil from palm oil (process with methane capture at oil mill)	***6.7***	***6.7***
pure oil from waste cooking oil	***1.4***	***1.4***

Disaggregated default values for transport and distribution of final fuel only. These are already included in table of "transport and distribution emissions e_{td}" as defined in part C of this Annex, but the following values are useful if an economic operator wishes to declare actual transport emissions for crops or oil transport only).

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	1.6	1.6
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	1.6	1.6
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant *)	1.6	1.6
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant *)	1.6	1.6
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant *)	1.6	1.6
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant *)	1.6	1.6
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	1.6	1.6
corn (maize) ethanol (natural gas as process fuel in CHP plant *)	1.6	1.6
corn (maize) ethanol (lignite as process fuel in CHP plant *)	1.6	1.6
corn (maize) ethanol (forest residues as process fuel in CHP plant *)	1.6	1.6
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	1.6	1.6
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant*)	1.6	1.6

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
other cereals excluding maize ethanol (lignite as process fuel in CHP plant *)	1.6	1.6
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant *)	1.6	1.6
sugar cane ethanol	6.0	6.0
the part of ethyl-tertio-butyl-ether (ETBE) from renewable ethanol	Will be considered equal to that of the ethanol production pathway used	
the part of tertiary-amyl-ethyl-ether (TAEE) from renewable ethanol	Will be considered equal to that of the ethanol production pathway used	
rape seed biodiesel	1.3	1.3
sunflower biodiesel	1.3	1.3
soybean biodiesel	1.3	1.3
palm oil biodiesel (open effluent pond)	1.3	1.3
palm oil biodiesel (process with methane capture at oil mill)	1.3	1.3
waste cooking oil biodiesel	1.3	1.3
animal fats from rendering biodiesel ****	1.3	1.3
hydrotreated vegetable oil from rape seed	1.2	1.2
hydrotreated vegetable oil from sunflower	1.2	1.2
hydrotreated vegetable oil from soybean	1.2	1.2
hydrotreated vegetable oil from palm oil (open effluent pond)	1.2	1.2
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	1.2	1.2
hydrotreated oil from waste cooking oil	1.2	1.2
hydrotreated oil from animal fats from rendering ****	1.2	1.2
pure vegetable oil from rape seed	0.8	0.8

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
pure vegetable oil from sunflower	0.8	0.8
pure vegetable oil from soybean	0.8	0.8
pure vegetable oil from palm oil (open effluent pond)	0.8	0.8
pure vegetable oil from palm oil (process with methane capture at oil mill)	0.8	0.8
pure oil from waste cooking oil	0.8	0.8

(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption for which emissions related to hygenisation as part of the rendering are not considered.

Total for cultivation, processing, transport and distribution

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	***30.7***	***38.2***
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	***21.6***	***25.5***
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant*)	***25.1***	***30.4***
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant*)	***19.5***	***22.5***
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant *)	***39.3***	***50.2***
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant *)	***27.6***	***33.9***
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	48.5	56.8
corn (maize) ethanol, (natural gas as process fuel in CHP plant*)	42.5	48.5
corn (maize) ethanol (lignite as process fuel in CHP plant*)	56.3	67.8
corn (maize) ethanol (forest residues as process fuel in CHP plant*)	29.5	30.3
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	50.2	58.5
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant*)	44.3	50.3
other cereals excluding maize ethanol (lignite as process fuel in CHP plant *)	59.5	71.7

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant *)	30.7	31.4
sugar cane ethanol	28.1	28.6
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	45.5	50.1
sunflower biodiesel	40.0	44.7
soybean biodiesel	***42.2***	***47.0***
palm oil biodiesel (open effluent pond)	***63.5***	***75.7***
palm oil biodiesel (process with methane capture at oil mill)	***46.3***	***51.6***
waste cooking oil biodiesel	***11.2***	***14.9***
animals fats from rendering biodiesel**	***15.3***	***20.8***
hydrotreated vegetable oil from rape seed	45.8	50.1
hydrotreated vegetable oil from sunflower	39.4	43.6
hydrotreated vegetable oil from soybean	42.2	46.5
hydrotreated vegetable oil from palm oil (open effluent pond)	***62.2***	***73.3***
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	***44.1***	***48.0***
hydrotreated oil from waste cooking oil	***11.9***	***16.0***
hydrotreated oil from animal fats from rendering**	***16.0***	***21.8***
pure vegetable oil from rape seed	38.5	40.0

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
pure vegetable oil from sunflower	32.7	34.3
pure vegetable oil from soybean	***35.2***	***36.9***
pure vegetable oil from palm oil (open effluent pond)	***56.3***	***65.4***
pure vegetable oil from palm oil (process with methane capture at oil mill)	***38.4***	***57.2***
pure oil from waste cooking oil	2.0	2.2

(**) ***Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption for which emissions related to hygenisation as part of the rendering are not considered.***

(*) Default values for processes using CHP are valid only if ALL the process heat is supplied by CHP.

E. ESTIMATED DISAGGREGATED DEFAULT VALUES FOR FUTURE BIOFUELS AND BIOLIQUIDS THAT WERE NOT ON THE MARKET OR WERE ONLY ON THE MARKET IN NEGLIGIBLE QUANTITIES IN 2016

Disaggregated default values for cultivation: 'e_{ec}' as defined in part C of this Annex including N_2O emissions (including chipping of waste or farmed wood)

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
wheat straw ethanol	1.8	1.8
waste wood Fischer-Tropsch diesel in free-standing plant	3.3	3.3
farmed wood Fischer-Tropsch diesel in free-standing plant	***8.2***	***8.2***
waste wood Fischer-Tropsch petrol in free-standing plant	***8.2***	***8.2***
farmed wood Fischer-Tropsch petrol in free-standing plant	12.4	12.4
waste wood dimethylether (DME) in free-standing plant	3.1	3.1
farmed wood dimethylether DME in free-standing plant	***7.6***	***7.6***
waste wood methanol in free-standing plant	3.1	3.1
farmed wood methanol in free-standing plant	***7.6***	***7.6***
Fischer Tropsch diesel from black-liquor gasification integrated with pulp mill	2.5	2.5

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Fischer Tropsch petrol from black-liquor gasification integrated with pulp mill	2.5	2.5
dimethylether DME from black-liquor gasification integrated with pulp mill	2.5	2.5
Methanol from black-liquor gasification integrated with pulp mill	2.5	2.5
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Disaggregated default values for soil N_2O emissions (included in disaggregated default values for cultivation emissions in 'e_{ec}' table)

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
wheat straw ethanol	0	0
waste wood Fischer-Tropsch diesel in free-standing plant	0	0
farmed wood Fischer-Tropsch diesel in free-standing plant	4.4	4.4
waste wood Fischer-Tropsch petrol in free-standing plant	0	0
farmed wood Fischer-Tropsch petrol in free-standing plant	4.4	4.4
waste wood dimethylether (DME) in free-standing plant	0	0
farmed wood dimethylether DME in free-standing plant	4.1	4.1
waste wood methanol in free-standing plant	0	0
farmed wood methanol in free-standing plant	4.1	4.1
Fischer-Tropsch diesel from black-liquor gasification integrated with pulp mill	0	0

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Fischer-Tropsch petrol from black-liquor gasification integrated with pulp mill	0	0
dimethylether DME from black-liquor gasification integrated with pulp mill	0	0
Methanol from black-liquor gasification integrated with pulp mill	0	0
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Disaggregated default values for processing: 'e_p' as defined in part C of this Annex

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
wheat straw ethanol	4.8	6.8
waste wood Fischer-Tropsch diesel in free-standing plant	0.1	0.1
farmed wood Fischer-Tropsch diesel in free-standing plant	0.1	0.1
waste wood Fischer-Tropsch petrol in free-standing plant	0.1	0.1
farmed wood Fischer-Tropsch petrol in free-standing plant	0.1	0.1
waste wood dimethylether (DME) in free-standing plant	0	0
farmed wood dimethylether (DME) in free-standing plant	0	0
waste wood methanol in free-standing plant	0	0
farmed wood methanol in free-standing plant	0	0
Fischer - Tropsch diesel from black-liquor gasification integrated with pulp mill	0	0

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Fischer – Tropsch petrol from black-liquor gasification integrated with pulp mill	0	0
dimethylether DME from black-liquor gasification integrated with pulp mill	0	0
methanol from black-liquor gasification integrated with pulp mill	0	0
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Disaggregated default values for transport and distribution: 'e_{td}' as defined in part C of this Annex

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
wheat straw ethanol	7.1	7.1
waste wood Fischer-Tropsch diesel in free-standing plant	10.3	10.3
farmed wood Fischer-Tropsch diesel in free-standing plant	8.4	8.4
waste wood Fischer-Tropsch petrol in free-standing plant	10.3	10.3
farmed wood Fischer-Tropsch petrol in free-standing plant	8.4	8.4
waste wood dimethylether (DME) in free-standing plant	10.4	10.4
farmed wood dimethylether (DME) in free-standing plant	8.6	8.6

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
waste wood methanol in free-standing plant	10.4	10.4
farmed wood methanol in free-standing plant	8.6	8.6
Fischer - Tropsch diesel from black-liquor gasification integrated with pulp mill	7.7	7.7
Fischer – Tropsch petrol from black-liquor gasification integrated with pulp mill	7.9	7.9
DME from black-liquor gasification integrated with pulp mill	7.7	7.7
methanol from black-liquor gasification integrated with pulp mill	7.9	7.9
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Disaggregated default values for transport and distribution of final fuel only. These are already included in table of "transport and distribution emissions e_{td}" as defined in part C of this Annex, but the following values are useful if an economic operator wishes to declare actual transport emissions for feedstock transport only).

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
wheat straw ethanol	1.6	1.6
waste wood Fischer-Tropsch diesel in free-standing plant	1.2	1.2
farmed wood Fischer-Tropsch diesel in free-standing plant	1.2	1.2
waste wood Fischer-Tropsch petrol in free-standing plant	1.2	1.2
farmed wood Fischer-Tropsch petrol in free-standing plant	1.2	1.2
waste wood dimethylether (DME) in free-standing plant	2.0	2.0
farmed wood DME in free-standing plant	2.0	2.0

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
waste wood methanol in free-standing plant	2.0	2.0
farmed wood methanol in free-standing plant	2.0	2.0
Fischer Tropsch diesel from black-liquor gasification integrated with pulp mill	2.0	2.0
Fischer Tropsch petrol from black-liquor gasification integrated with pulp mill	2.0	2.0
DME from black-liquor gasification integrated with pulp mill	2.0	2.0
methanol from black-liquor gasification integrated with pulp mill	2.0	2.0
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Total for cultivation, processing, transport and distribution

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
wheat straw ethanol	13.7	15.7
waste wood Fischer-Tropsch diesel in free-standing plant	13.7	13.7
farmed wood Fischer-Tropsch diesel in free-standing plant	***16.7***	***16.7***
waste wood Fischer-Tropsch petrol in free-standing plant	13.7	13.7
farmed wood Fischer-Tropsch petrol in free-standing plant	***16.7***	***16.7***
waste wood dimethylether (DME) in free-standing plant	13.5	13.5
farmed wood dimethylether (DME) in free-standing plant	***16.2***	***16.2***

Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
waste wood methanol in free-standing plant	13.5	13.5
farmed wood methanol in free-standing plant	***16.2***	***16.2***
Fischer - Tropsch diesel from black-liquor gasification integrated with pulp mill	10.2	10.2
Fischer – Tropsch petrol from black-liquor gasification integrated with pulp mill	10.4	10.4
dimethylether DME from black-liquor gasification integrated with pulp mill	10.2	10.2
methanol from black-liquor gasification integrated with pulp mill	10.4	10.4
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

ANNEX VI

Rules for calculating the greenhouse gas impact of biomass fuels and their fossil fuel comparators

A. Typical and default values of greenhouse gas emission savings for biomass fuels if produced with no net-carbon emissions from land-use change

WOODCHIPS					
Biomass fuel production system	Transport distance	Typical greenhouse gas emission savings		Default greenhouse gas emission savings	
		Heat	Electricity	Heat	Electricity
Woodchips from forest residues	1 to 500 km	93 %	89 %	91 %	87 %
	500 to 2500 km	89 %	84 %	87 %	81 %
	2500 to 10 000 km	82 %	73 %	78 %	67 %
	Above 10000 km	67 %	51 %	60 %	41 %
Woodchips from short rotation coppice (Eucalyptus)	2500 to 10 000 km	***77*** %	***65*** %	***73*** %	***60*** %
Woodchips from short rotation coppice (Poplar - Fertilised)	1 to 500 km	89 %	83 %	87 %	81 %
	500 to 2500 km	85 %	78 %	84 %	76 %
	2500 to 10 000 km	78 %	67 %	74 %	62 %
	Above 10000 km	63 %	45 %	57 %	35 %
Woodchips from short rotation coppice (Poplar – No fertilisation)	1 to 500 km	91 %	87 %	90 %	85 %
	500 to 2500 km	88 %	82 %	86 %	79 %
	2500 to 10 000 km	80 %	70 %	77 %	65 %
	Above 10000 km	65 %	48 %	59 %	39 %

WOODCHIPS					
Biomass fuel production system	Transport distance	Typical greenhouse gas emission savings		Default greenhouse gas emission savings	
		Heat	Electricity	Heat	Electricity
Woodchips from stemwood	1 to 500 km	93 %	89 %	92 %	88 %
	500 to 2500 km	90 %	85 %	88 %	82 %
	2500 to 10 000 km	82 %	73 %	79 %	68 %
	Above 10000 km	67 %	51 %	61 %	42 %
Woodchips from industry residues	1 to 500 km	94 %	92 %	93 %	90 %
	500 to 2500 km	91 %	87 %	90 %	85 %
	2500 to 10 000 km	83 %	75 %	80 %	71 %
	Above 10000 km	69 %	54 %	63 %	44 %

WOOD PELLETS*						
Biomass fuel production system		Transport distance	Typical greenhouse gas emission savings		Default greenhouse gas emission savings	
			Heat	Electricity	Heat	Electricity
Wood briquettes or pellets from forest residues	Case 1	1 to 500 km	58 %	37 %	49 %	24 %
		500 to 2500 km	58 %	37 %	49 %	25 %
		2500 to 10 000 km	55 %	34 %	47 %	21 %
		Above 10000 km	50 %	26 %	40 %	11 %
	Case 2a	1 to 500 km	77 %	66 %	72 %	59 %
		500 to 2500 km	77 %	66 %	72 %	59 %
		2500 to 10 000 km	75 %	62 %	70 %	55 %
		Above 10000 km	69 %	54 %	63 %	45 %
	Case 3a	1 to 500 km	92 %	88 %	90 %	85 %
		500 to 2500 km	92 %	88 %	90 %	86 %
		2500 to 10 000 km	90 %	85 %	88 %	81 %
		Above 10000 km	84 %	76 %	81 %	72 %
Wood briquettes or pellets from short rotation coppice (Eucalyptus)	Case 1	2500 to 10 000 km	***52*** %	***28*** %	***43*** %	***15*** %
	Case 2a	2500 to 10 000 km	***70*** %	***56*** %	***66*** %	***49*** %
	Case 3a	2500 to 10 000 km	***85*** %	***78*** %	***83*** %	***75*** %
Wood briquettes or pellets from short rotation coppice (Poplar - Fertilised)	Case 1	1 to 500 km	54 %	32 %	46 %	20 %
		500 to 10 000 km	52 %	29 %	44 %	16 %
		Above 10 000 km	47 %	21 %	37 %	7 %
	Case 2a	1 to 500 km	73 %	60 %	69 %	54 %
		500 to 10 000 km	71 %	57 %	67 %	50 %
		Above 10 000 km	66 %	49 %	60 %	41 %
	Case 3a	1 to 500 km	88 %	82 %	87 %	81 %
		500 to 10 000 km	86 %	79 %	84 %	77 %
		Above 10 000 km	80 %	71 %	78 %	67 %

WOOD PELLETS*						
Biomass fuel production system		Transport distance	Typical greenhouse gas emission savings		Default greenhouse gas emission savings	
			Heat	Electricity	Heat	Electricity
Wood briquettes or pellets from short rotation coppice (Poplar – No fertilisation)	Case 1	1 to 500 km	56 %	35 %	48 %	23 %
		500 to 10 000 km	54 %	32 %	46 %	20 %
		Above 10 000 km	49 %	24 %	40 %	10 %
	Case 2a	1 to 500 km	76 %	64 %	72 %	58 %
		500 to 10 000 km	74 %	61 %	69 %	54 %
		Above 10 000 km	68 %	53 %	63 %	45 %
	Case 3a	1 to 500 km	91 %	86 %	90 %	85 %
		500 to 10 000 km	89 %	83 %	87 %	81 %
		Above 10 000 km	83 %	75 %	81 %	71 %
Stemwood	Case 1	1 to 500 km	57 %	37 %	49 %	24 %
		500 to 2500 km	58 %	37 %	49 %	25 %
		2500 to 10 000 km	55 %	34 %	47 %	21 %
		Above 10000 km	50 %	26 %	40 %	11 %
	Case 2a	1 to 500 km	77 %	66 %	73 %	60 %
		500 to 2500 km	77 %	66 %	73 %	60 %
		2500 to 10 000 km	75 %	63 %	70 %	56 %
		Above 10000 km	70 %	55 %	64 %	46 %
	Case 3a	1 to 500 km	92 %	88 %	91 %	86 %
		500 to 2500 km	92 %	88 %	91 %	87 %
		2500 to 10 000 km	90 %	85 %	88 %	83 %
		Above 10000 km	84 %	77 %	82 %	73 %

WOOD PELLETS*						
Biomass fuel production system		Transport distance	Typical greenhouse gas emission savings		Default greenhouse gas emission savings	
			Heat	Electricity	Heat	Electricity
Wood briquettes or pellets from wood industry residues	Case 1	1 to 500 km	75 %	62 %	69 %	55 %
		500 to 2500 km	75 %	62 %	70 %	55 %
		2500 to 10 000 km	72 %	59 %	67 %	51 %
		Above 10000 km	67 %	51 %	61 %	42 %
	Case 2a	1 to 500 km	87 %	80 %	84 %	76 %
		500 to 2500 km	87 %	80 %	84 %	77 %
		2500 to 10 000 km	85 %	77 %	82 %	73 %
		Above 10000 km	79 %	69 %	75 %	63 %
	Case 3a	1 to 500 km	95 %	93 %	94 %	91 %
		500 to 2500 km	95 %	93 %	94 %	92 %
		2500 to 10 000 km	93 %	90 %	92 %	88 %
		Above 10000 km	88 %	82 %	85 %	78 %

* Case 1 refers to processes in which a natural gas boiler is used to provide the process heat to the pellet mill. Power for the pellet mill is supplied from the grid;

Case 2a refers to processes in which a woodchips boiler, fed with pre-dried chips, is used to provide process heat. Power for the pellet mill is supplied from the grid;

Case 3a refers to processes in which a CHP, fed with pre-dried woodchips, is used to provide power and heat to the pellet mill.

AGRICULTURE PATHWAYS					
Biomass fuel production system	Transport distance	Typical greenhouse gas emission savings		Default greenhouse gas emission savings	
		Heat	Electricity	Heat	Electricity
Agricultural Residues with density <0.2 t/m3*	1 to 500 km	95 %	92 %	93 %	90 %
	500 to 2500 km	89 %	83 %	86 %	80 %
	2500 to 10 000 km	77 %	66 %	73 %	60 %
	Above 10000 km	57 %	36 %	48 %	23 %
Agricultural Residues with density > 0.2 t/m3**	1 to 500 km	95 %	92 %	93 %	90 %
	500 to 2500 km	93 %	89 %	92 %	87 %
	2500 to 10 000 km	88 %	82 %	85 %	78 %
	Above 10000 km	78 %	68 %	74 %	61 %
Straw pellets	1 to 500 km	88 %	82 %	85 %	78 %
	500 to 10000 km	86 %	79 %	83 %	74 %
	Above 10000 km	80 %	70 %	76 %	64 %

Bagasse briquettes	500 to 10 000 km	93 %	89 %	91 %	87 %
	Above 10 000 km	87 %	81 %	85 %	77 %
Palm Kernel Meal	Above 10000 km	20 %	-18 %	11 %	-33 %
Palm Kernel Meal (no CH_4 emissions from oil mill)	Above 10000 km	46 %	20 %	42 %	14 %

* This group of materials includes agricultural residues with a low bulk density and it comprises materials such as straw bales, oat hulls, rice husks and sugar cane bagasse bales (not exhaustive list)

** The group of agricultural residues with higher bulk density includes materials such as corn cobs, nut shells, soybean hulls, palm kernel shells (not exhaustive list).

BIOGAS FOR ELECTRICITY*				
Biogas production system		Technological option	Typical greenhouse gas emission savings	Default greenhouse gas emission savings
Wet manure[1]	Case 1	Open digestate[2]	146 %	94 %
		Close digestate[3]	246 %	240 %
	Case 2	Open digestate	136 %	85 %
		Close digestate	227 %	219 %
	Case 3	Open digestate	142 %	86 %
		Close digestate	243 %	235 %

[1] The values for biogas production from manure include negative emissions for emissions saved from raw manure management. The value of esca considered is equal to -45 gCO_{2eq}/MJ manure used in anaerobic digestion

[2] ***Open storage of digestate accounts for additional emissions of methane and N_2O. The magnitude of these emissions changes with ambient conditions, substrate types and the digestion efficiency (see chapter 5 for more details).***

[3] ***Close storage means that the digestate resulting from the digestion process is stored in a gas-tight tank and the additional biogas released during storage is considered to be recovered for production of additional electricity or biomethane. No emissions of GHG are included in this process.***

BIOGAS FOR ELECTRICITY*				
Biogas production system		Technological option	Typical greenhouse gas emission savings	Default greenhouse gas emission savings
Maize whole plant[1]	Case 1	Open digestate	36 %	21 %
		Close digestate	59 %	53 %
	Case 2	Open digestate	34 %	18 %
		Close digestate	55 %	47 %
	Case 3	Open digestate	28 %	10 %
		Close digestate	52 %	43 %

[1] ***Maize whole plant should be interpreted as maize harvested as fodder and ensiled for preservation.***

BIOGAS FOR ELECTRICITY*				
Biogas production system		Technological option	Typical greenhouse gas emission savings	Default greenhouse gas emission savings
Biowaste	Case 1	Open digestate	47 %	26 %
		Close digestate	84 %	78 %
	Case 2	Open digestate	43 %	21 %
		Close digestate	77 %	68 %
	Case 3	Open digestate	38 %	14 %
		Close digestate	76 %	66 %

* Case 1 refers to pathways in which power and heat required in the process are supplied by the CHP engine itself.

Case 2 refers to pathways in which the electricity required in the process is taken from the grid and the process heat is supplied by the CHP engine itself. In some Member States, operators are not allowed to claim the gross production for subsidies and Case 1 is the more likely configuration.

Case 3 refers to pathways in which the electricity required in the process is taken from the grid and the process heat is supplied by a biogas boiler. This case applies to some installations in which the CHP engine is not on-site and biogas is sold (but not upgraded to biomethane).

BIOGAS FOR ELECTRICITY – MIXTURES OF MANURE AND MAIZE				
Biogas production system		***Technological option***	***Typical greenhouse gas emission savings***	***Default greenhouse gas emission savings***
Manure – Maize 80 % - 20 %	***Case 1***	***Open digestate***	***72 %***	***45 %***
		Close digestate	***120 %***	***114 %***
	Case 2	***Open digestate***	***67 %***	***40 %***
		Close digestate	***111 %***	***103 %***
	Case 3	***Open digestate***	***65 %***	***35 %***
		Close digestate	***114 %***	***106 %***
Manure – Maize 70 % - 30 %	***Case 1***	***Open digestate***	***60 %***	***37 %***
		Close digestate	***100 %***	***94 %***
	Case 2	***Open digestate***	***57 %***	***32 %***
		Close digestate	***93 %***	***85 %***
	Case 3	***Open digestate***	***53 %***	***27 %***
		Close digestate	***94 %***	***85 %***
Manure – Maize 60 % - 40 %	***Case 1***	***Open digestate***	***53 %***	***32 %***
		Close digestate	***88 %***	***82 %***
	Case 2	***Open digestate***	***50 %***	***28 %***
		Close digestate	***82 %***	***73 %***
	Case 3	***Open digestate***	***46 %***	***22 %***
		Close digestate	***81 %***	***72 %***

BIOMETHANE FOR TRANSPORT*			
Biomethane production system	Technological options	Typical greenhouse gas emission savings	Default greenhouse gas emission savings
Wet manure	Open digestate, no off-gas combustion	117 %	72 %
	Open digestate, off-gas combustion	133 %	94 %
	Close digestate, no off-gas combustion	190 %	179 %
	Close digestate, off-gas combustion	206 %	202 %
Maize whole plant	Open digestate, no off-gas combustion	35 %	17 %
	Open digestate, off-gas combustion	51 %	39 %
	Close digestate, no off-gas combustion	52 %	41 %
	Close digestate, off-gas combustion	68 %	63 %
Biowaste	Open digestate, no off-gas combustion	43 %	20 %
	Open digestate, off-gas combustion	59 %	42 %
	Close digestate, no off-gas combustion	70 %	58 %
	Close digestate, off-gas combustion	86 %	80 %

* The savings for biomethane only refer to compressed biomethane relative to the fossil fuel comparator for transport of 94 gCO_{2eq}/MJ.

BIOMETHANE - MIXTURES OF MANURE AND MAIZE*			
Biomethane production system	Technological options	Typical greenhouse gas emission savings	Default greenhouse gas emission savings
Manure – Maize 80 % - 20 %	Open digestate, no off-gas combustion[1]	62 %	35 %
	Open digestate, off-gas combustion[2]	78 %	57 %
	Close digestate, no off-gas combustion	97 %	86 %
	Close digestate, off-gas combustion	113 %	108 %
Manure – Maize 70 % - 30 %	Open digestate, no off-gas combustion	53 %	29 %
	Open digestate, off-gas combustion	69 %	51 %
	Close digestate, no off-gas combustion	83 %	71 %
	Close digestate, off-gas combustion	99 %	94 %

[1] This category includes the following categories of technologies for biogas upgrade to biomethane: Pressure Swing Adsorption (PSA), Pressure Water Scrubbing (PWS), Membranes, Cryogenic, and Organic Physical Scrubbing (OPS). It includes an emission of 0.03 $MJCH_4$/MJbiomethane for the emission of methane in the off-gases.

[2] This category includes the following categories of technologies for biogas upgrade to biomethane: Pressure Water Scrubbing (PWS) when water is recycled, Pressure Swing Adsorption (PSA), Chemical Scrubbing, Organic Physical Scrubbing (OPS), Membranes and Cryogenic upgrading. No methane emissions are considered for this category (the methane in the off-gas is combusted, if any).

BIOMETHANE - MIXTURES OF MANURE AND MAIZE*			
Biomethane production system	Technological options	Typical greenhouse gas emission savings	Default greenhouse gas emission savings
Manure – Maize 60 % - 40 %	Open digestate, no off-gas combustion	48 %	25 %
	Open digestate, off-gas combustion	64 %	48 %
	Close digestate, no off-gas combustion	74 %	62 %
	Close digestate, off-gas combustion	90 %	84 %

* The greenhouse gas emission savings for biomethane only refer to compressed biomethane relative to the fossil fuel comparator for transport of 94 gCO_{2eq}/MJ.

B. METHODOLOGY

1. Greenhouse gas emissions from the production and use of biomass fuels, shall be calculated as follows:

(a) Greenhouse gas emissions from the production and use of biomass fuels before conversion into electricity, heating and cooling, shall be calculated as:

$E = e_{ec} + e_{l} + e_{p} + e_{td} + e_{u} - e_{sca} – e_{ccs} - e_{ccr}$,

Where

E = total emissions from the production of the fuel before energy conversion;

e_{ec} = emissions from the extraction or cultivation of raw materials;

e_{l} = annualised emissions from carbon stock changes caused by land use change;

e_{p} = emissions from processing;

e_{td} = emissions from transport and distribution;

e_{u} = emissions from the fuel in use;

e_{sca} = emission savings from soil carbon accumulation via improved agricultural management;

e_{ccs} = emission savings from carbon capture and geological storage; and

e_{ccr} = emission savings from carbon capture and replacement.

Emissions from the manufacture of machinery and equipment shall not be taken into account.

(b) In case of co-digestion of different substrates in a biogas plant for the production of biogas or biomethane the typical and default values of greenhouse gas emissions shall be calculated as:

$$E = \sum_1^n S_n \cdot E_n$$

where

E = GHG emissions per MJ biogas or biomethane produced from co-digestion of the defined mixture of substrates

S_n = Share of feedstock n in energy content

E_n = Emission in gCO_2/MJ for pathway n as provided in Part D of this document*

$$S_n = \frac{P_n \cdot W_n}{\sum_1^n P_n \cdot W_n}$$

where

P_n = energy yield [MJ] per kilogram of wet input of feedstock n**

W_n = weighting factor of substrate n defined as:

$$W_n = \frac{I_n}{\sum_1^n I_n} \cdot \left(\frac{1 - AM_n}{1 - SM_n}\right)$$

where:

I_n = Annual input to digester of substrate n [tonne of fresh matter]

AM_n = Average annual moisture of substrate n [kg water / kg fresh matter]

SM_n = Standard moisture for substrate n***.

* For animal manure used as substrate, a bonus of 45 gCO_{2eq}/MJ manure (-54 kg CO_{2eq}/t fresh matter) is added for improved agricultural and manure management.

** The following values of P_n shall be used for calculating typical and default values:

P(Maize): 4.16 [MJ_{biogas}/kg $_{\text{wet maize @ 65 \% moisture}}$]

P(Manure): 0.50 [MJ_{biogas}/kg $_{\text{wet manure @ 90 \% moisture}}$]

P(Biowaste) 3.41 [MJ_{biogas}/kg $_{\text{wet biowaste @ 76 \% moisture}}$]

** The following values of the standard moisture for substrate SM_n shall be used:

SM(Maize): 0.65 [kg water/kg fresh matter]

SM(Manure): 0.90 [kg water/kg fresh matter]

SM(Biowaste): 0.76 [kg water/kg fresh matter]

(c) In case of co-digestion of n substrates in a biogas plant for the production of electricity or biomethane, actual greenhouse gas emissions of biogas and biomethane are calculated as follows:

$$E = \sum_{1}^{n} S_n \cdot \left(e_{ec,n} + e_{td,feedstock\ ,n} + e_{l,n} - e_{sca,n}\right) + e_p + e_{td,product} + e_u - e_{ccs} - e_{ccr}$$

where

E= total emissions from the production of the biogas or biomethane before energy conversion;

Sn = Share of feedstock n, in fraction of input to the digester

$e_{ec,n}$ = emissions from the extraction or cultivation of feedstock n;

$e_{td,feedstock,n}$ = emissions from transport of feedstock n to the digester;

$e_{l,n}$ = annualised emissions from carbon stock changes caused by land use change, for feedstock n;

e_{sca} = emission savings from improved agricultural management of feedstock n*;

e_p = emissions from processing;

$e_{td,product}$ = emissions from transport and distribution of biogas and/or biomethane;

e_u = emissions from the fuel in use, that is greenhouse gases emitted during combustion;

e_{ccs} = emission savings from carbon capture and geological storage; and

e_{ccr} = emission savings from carbon capture and replacement.

* For e_{sca} a bonus of 45 $gCO_{2eq.}$ / MJ manure shall be attributed for improved agricultural and manure management in case animal manure is used as a substrate for the production of biogas and biomethane.

(d) Greenhouse gas emissions from the use of biomass fuels in producing electricity, heating and cooling, including the energy conversion to electricity and/ or heat or cooling produced shall be calculated as follows:

(i) For energy installations delivering only heat:

$$EC_h = \frac{E}{\eta_h}$$

(ii) For energy installations delivering only electricity:

$$EC_{el} = \frac{E}{\eta_{el}}$$

where

$EC_{h,el}$ = Total greenhouse gas emissions from the final energy commodity.

E = Total greenhouse gas emissions of the fuel before end-conversion.

η_{el} = The electrical efficiency, defined as the annual electricity produced divided by the annual fuel input, based on its energy content.

η_h = The heat efficiency, defined as the annual useful heat output divided by the annual fuel input, based on its energy content.

(iii) For the electricity or mechanical energy coming from energy installations delivering useful heat together with electricity and/or mechanical energy:

$$EC_{el} = \frac{E}{\eta_{el}} \left(\frac{C_{el} \cdot \eta_{el}}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

(iv) For the useful heat coming from energy installations delivering heat together with electricity and/or mechanical energy:

$$EC_h = \frac{E}{\eta_h} \left(\frac{C_h \cdot \eta_h}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

where:

$EC_{h,el}$ = Total greenhouse gas emissions from the final energy commodity.

E = Total greenhouse gas emissions of the fuel before end-conversion.

η_{el} = The electrical efficiency, defined as the annual electricity produced divided by the annual energy input, based on its energy content.

η_h = The heat efficiency, defined as the annual useful heat output divided by the annual energy input, based on its energy content.

C_{el} = Fraction of exergy in the electricity, and/or mechanical energy, set to 100 % ($C_{el} = 1$).

C_h = Carnot efficiency (fraction of exergy in the useful heat).

The Carnot efficiency, C_h, for useful heat at different temperatures is defined as:

$$C_h = \frac{T_h - T_0}{T_h}$$

where:

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at point of delivery.

T_0 = Temperature of surroundings, set at 273.15 kelvin (equal to 0 °C)

If the excess heat is exported for heating of buildings, at a temperature below 150 °C (423.15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423.15 kelvin), which is: 0.3546

For the purposes of this calculation, the following definitions shall apply:

(i) "cogeneration" shall mean the simultaneous generation in one process of thermal energy and electricity and/or mechanical energy;

(ii) "useful heat" shall mean heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes;

(iii) "economically justifiable demand" shall mean the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions.

2. Greenhouse gas emissions from biomass fuels shall be expressed as follows

(a) greenhouse gas emissions from biomass fuels E, shall be expressed in terms of grams of CO_2 equivalent per MJ of biomass fuel, gCO_{2eq}/MJ.

(b) greenhouse gas emissions from heating or electricity, produced from biomass fuels, EC, shall be expressed in terms of grams of CO_2 equivalent per MJ of final energy commodity (heat or electricity), gCO_{2eq}/MJ.

When heating and cooling are co-generated with electricity, emissions shall be allocated between heat and electricity (as under 1(d)) irrespective if the heat is used for actual heating purposes or for cooling.[1]

Where the greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} are expressed in unit g CO_2eq/dry-ton of feedstock the conversion to grams of CO_2 equivalent per MJ of fuel, gCO_{2eq} /MJ shall be calculated as follows[2];

$$e_{ec}fuel_a\left[\frac{gCO_2eq}{MJ\ fuel}\right]_{ec} = \frac{e_{ec}\ feedstock_a\ \left[\frac{gCO_2eq}{t_{dry}}\right]}{LHV_a\left[\frac{MJ\ feedstock}{t\ dry\ feedstock}\right]} * Fuel\ feedstock\ factor_a * Allocation\ factor\ fuel_a$$

[1] Heat or waste heat is used to generate cooling (chilled air or water) through absorption chillers. Therefore, it is appropriate to calculate only the emissions associated to the heat produced, per MJ of heat, irrespectively if the end-use of the heat is actual heating or cooling via absorption chillers.

[2] ***The formula for calculating greenhouse gas emissions from the extraction or cultivation of raw materials eec describes cases where feedstock is converted into biofuels in one step. For more complex supply chains, adjustments are needed for calculating greenhouse gas emissions from the extraction or cultivation of raw materials eec for intermediate products.***

Where

$$Allocation\ factor\ fuel_a = \left[\frac{Energy\ in\ fuel}{Energy\ fuel + Energy\ in\ co-products}\right]$$

$$Fuel\ feedstock\ factor_a = [Ratio\ of\ MJ\ feedstock\ required\ to\ make\ 1\ MJ\ fuel]$$

Emissions per dry-ton feedstock shall be calculated as follows:

$$e_{ec}feedstock_a\left[\frac{gCO_2eq}{t_{dry}}\right] = \frac{e_{ec}\ feedstock_a\ \left[\frac{gCO_2eq}{t_{moist}}\right]}{(1 - moisture\ content)}$$

3. Greenhouse gas emission savings from biomass fuels shall be calculated as follows:

(a) greenhouse gas emission savings from biomass fuels used as transport fuels:

SAVING = $(E_{F(t)} – E_{B▌})/ E_{F(t)}▌$

where

$E_{B▌}$ = total emissions from the biofuel or bioliquid; and

$E_{F(t)}$ = total emissions from the fossil fuel comparator for transport

(b) greenhouse gas emission savings from heat and cooling, and electricity being generated from biomass fuels as follows:

$SAVING = (EC_{F(h\&c,el)} - EC_{B(h\&c,el)})/EC_{F\ (h\&c,el)}$,

where

$EC_{B(h\&c,el)}$= total emissions from the heat or electricity,

$EC_{F(h\&c,el)}$ = total emissions from the fossil fuel comparator for useful heat or electricity.

4. The greenhouse gases taken into account for the purposes of point 1 shall be CO_2, N_2O and CH_4. For the purpose of calculating CO_2 equivalence, those gases shall be valued as follows:

CO_2: 1

N_2O: 298

CH_4: 25

5. Emissions from the extraction, harvesting or cultivation of raw materials, e_{ec}, shall include emissions from the extraction, harvesting or cultivation process itself; from the collection, drying and storage of raw materials; from waste and leakages; and from the production of chemicals or products used in extraction or cultivation. Capture of CO_2 in the cultivation of raw materials shall be excluded. Estimates of emissions from agriculture biomass cultivation may be derived from the regional averages for cultivation emissions included in the reports referred to in Article 28 (4) of this Directive ***or*** the information on the disaggregated default values for cultivation emissions included in this Annex, as an alternative to using actual values. In absence of relevant information in the before mentioned reports it is allowed to calculate averages based on local farming practises based for instance on data of a group of farms, as an alternative to using actual values.

   Estimates of emissions from cultivation and harvesting of forestry biomass, may be derived from the use of averages for cultivation and harvesting emissions calculated for geographical areas at national level, as an alternative to using actual values.

6. For the purposes of the calculation referred to in point ***1, sub-point (a),*** emission savings from improved agriculture management $\boldsymbol{e_{sca}}$, such as shifting to reduced or zero-tillage, improved crop/rotation, the use of cover crops, including crop management, and the use of organic soil improver (e.g. compost, manure fermentation digestate), shall be taken into account only if solid and verifiable evidence is provided that the soil carbon has increased or that it is reasonable to expect to have increased over the period in which the raw materials concerned were cultivated while taking into account the emissions where such practices lead to increased fertiliser and herbicide use[1].

[1] ***Measurements of soil carbon can constitute such evidence, e.g. by a first measurement in advance of the cultivation and subsequent ones at regular intervals several years apart. In such case, before the second measurement is available, increase in soil carbon would be estimated on the basis of representative experiments or soil models. From the second measurement onwards, the measurements would constitute the basis for determining the existence of an increase in soil carbon and its magnitude.***

7. Annualised emissions from carbon stock changes caused by land-use change, el, shall be calculated by dividing total emissions equally over 20 years. For the calculation of those emissions the following rule shall be applied:

$e_l = (CS_R – CS_A) \times 3{,}664 \times 1/20 \times 1/P – e_B$,[1]

where

e_l = annualised greenhouse gas emissions from carbon stock change due to land-use change (measured as mass of CO_2-equivalent per unit biomass fuel energy). 'Cropland'[2] and 'perennial cropland'[3] shall be regarded as one land use ;

CS_R = the carbon stock per unit area associated with the reference land use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). The reference land use shall be the land use in January 2008 or 20 years before the raw material was obtained, whichever was the later;

CS_A = the carbon stock per unit area associated with the actual land use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). In cases where the carbon stock accumulates over more than one year, the value attributed to CS_A shall be the estimated stock per unit area after 20 years or when the crop reaches maturity, whichever the earlier; and

P = the productivity of the crop (measured as biomass fuel energy per unit area per year).

e_B = bonus of 29 gCO_{2eq}/MJ biomass fuel if biomass is obtained from restored degraded land under the conditions provided for in point 8.

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1 The quotient obtained by dividing the molecular weight of CO_2 (44,010 g/mol) by the molecular weight of carbon (12,011 g/mol) is equal to 3,664.

2 Cropland as defined by IPCC

3 Perennial crops are defined as multi-annual crops, the stem of which is usually not annually harvested such as short rotation coppice and oil palm.

8. The bonus of 29 gCO_{2eq} /MJ shall be attributed if evidence is provided that the land:

(a) was not in use for agriculture in January 2008; and

(b) is severely degraded land, including such land that was formerly in agricultural use.

The bonus of 29 gCO_{2eq} /MJ shall apply for a period of up to 20 years from the date of conversion of the land to agricultural use, provided that a steady increase in carbon stocks as well as a sizable reduction in erosion phenomena for land falling under (b) are ensured.

9. 'Severely degraded land' means land that, for a significant period of time, has either been significantly salinated or presented significantly low organic matter content and has been severely eroded.

10. In accordance with Annex V, Part C, point 10 of this Directive guidelines for the calculation of land carbon stocks[1] adopted in relation to that Directive, drawing on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories — volume 4, and in accordance with the Regulation (EU) No 525/2013[2] and the Regulation (INSERT THE NO AFTER THE ADOPTION[3]), shall serve as the basis for the calculation of land carbon stocks.

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1 Commission Decision 2010/335/EU of 10 June 2010 on guidelines for the calculation of land carbon stocks for the purpose of Annex V to Directive 2009/28/EC (OJ L 151, 17.6.2010, p. 19).

2 Regulation (EU) 525/2013 of the European Parliament and of the Council of 21 may 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC (OJ L 165, 18.6.2013, p. 13).

3 Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (OJ L 156, 19.6.2018, p. 1).

11. Emissions from processing, e_p, shall include emissions from the processing itself; from waste and leakages; and from the production of chemicals or products used in processing***, including the carbon dioxide emissions corresponding to the carbon contents of fossil inputs, whether or not actually combusted in the process***.

In accounting for the consumption of electricity not produced within the ***solid or*** gaseous biomass fuel production plant, the greenhouse gas emission intensity of the production and distribution of that electricity shall be assumed to be equal to the average emission intensity of the production and distribution of electricity in a defined region. By derogation from this rule, producers may use an average value for an individual electricity production plant for electricity produced by that plant, if that plant is not connected to the electricity grid.

▌

Emissions from processing shall include emissions from drying of interim- products and materials where relevant.

12. Emissions from transport and distribution, e_{td}, shall include emissions from the transport of raw and semi-finished materials and from the storage and distribution of finished materials. Emissions from transport and distribution to be taken into account under point 5 shall not be covered by this point.

13. Emissions of CO_2 from fuel in use, $e_{u,}$ shall be taken to be zero for biomass fuels. Emissions of non-CO_2 greenhouse gases (CH_4 and N_2O) from the fuel in use shall be included in the e_u factor.

14. Emission saving from carbon capture and geological storage , e_{ccs}, that have not already been accounted for in e_p, shall be limited to emissions avoided through the capture and storage of emitted CO_2 directly related to the extraction, transport, processing and distribution of biomass fuel if stored in compliance with Directive 2009/31/EC on the geological storage of carbon dioxide.

15. Emission saving from carbon capture and replacement, e_{ccr}, shall be related directly to the production of biomass fuel they are attributed to, and shall be limited to emissions avoided through the capture of CO_2 of which the carbon originates from biomass and which is used to replace fossil-derived CO_2 ▌.

16. Where a cogeneration unit – providing heat and/ or electricity to a biomass fuel production process for which emissions are being calculated - produces excess electricity and/or excess useful heat, the greenhouse gas emissions shall be divided between the electricity and the useful heat according to the temperature of the heat (which reflects the usefulness (utility) of the heat). The ***useful part of the heat is found by multiplying its energy content with the*** Carnot efficiency Ch , ▌ calculated as follows ▌:

$$C_h = \frac{T_h - T_0}{T_h}$$

where

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at point of delivery.

T_0 = Temperature of surroundings, set at 273.15 kelvin (equal to 0 °C)

If the excess heat is exported for heating of buildings, at a temperature below 150 °C (423.15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423.15 kelvin), which is: 0.3546

For the purposes of this calculation, the actual efficiencies shall be used, defined as the annual mechanical energy, electricity and heat produced respectively divided by the annual energy input.

For the purposes of this calculation, the following definitions shall apply:

(a) "cogeneration" shall mean the simultaneous generation in one process of thermal energy and electrical and/or mechanical energy;

(b) "useful heat" shall mean heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes;

(c) "economically justifiable demand" shall mean the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions

17. Where a biomass fuel production process produces, in combination, the fuel for which emissions are being calculated and one or more other products ("co-products"), greenhouse gas emissions shall be divided between the fuel or its intermediate product and the co-products in proportion to their energy content (determined by lower heating value in the case of co-products other than electricity and heat). The greenhouse gas intensity of excess useful heat or excess electricity is the same as the greenhouse gas intensity of heat or electricity delivered to the biomass fuel production process and is determined from calculating the greenhouse gas intensity of all inputs and emissions, including the feedstock and CH_4 and N_2O emissions, to and from the cogeneration unit, boiler or other apparatus delivering heat or electricity to the biomass fuel production process . In case of cogeneration of electricity and heat the calculation is performed following point 16.

18. For the purposes of the calculations referred to in point 17, the emissions to be divided shall be $e_{ec} + e_l + e_{sca}$ + those fractions of $e_{p,}$ $e_{td,}$ e_{ccs} and e_{ccr} that take place up to and including the process step at which a co-product is produced. If any allocation to co-products has taken place at an earlier process step in the life-cycle, the fraction of those emissions assigned in the last such process step to the intermediate fuel product shall be used for this purpose instead of the total of those emissions.

In the case of biogas and biomethane, all co-products that do not fall under the scope of point 7 shall be taken into account for the purposes of that calculation. No emissions shall be allocated to wastes and residues. Co-products that have a negative energy content shall be considered to have an energy content of zero for the purpose of the calculation.

Wastes and residues, including tree tops and branches, straw, husks, cobs and nut shells, and residues from processing, including crude glycerine (glycerine that is not refined) and bagasse, shall be considered to have zero life-cycle greenhouse gas emissions up to the process of collection of those materials irrespectively of whether they are processed to interim products before being transformed into the final product.

In the case of biomass fuels produced in refineries, other than the combination of processing plants with boilers or cogeneration units providing heat and/or electricity to the processing plant, the unit of analysis for the purposes of the calculation referred to in point 17 shall be the refinery.

19. For biomass fuels used for electricity production, for the purposes of the calculation referred to in point 3, the fossil fuel comparator $EC_{F(el)}$ shall be 183 gCO_{2eq}/MJ electricity ***or 212 g CO_{2eq}/MJ electricity for the outermost regions***.

For biomass fuels used for useful heat, for heating and/or cooling production, for the purposes of the calculation referred to in point 3, the fossil fuel comparator $EC_{F(h)}$ shall be 80 gCO_{2eq}/MJ heat.

For biomass fuels used for useful heat production, in which a direct physical substitution of coal can be demonstrated, for the purposes of the calculation referred to in point 3, the fossil fuel comparator $EC_{F(h)}$ shall be 124 gCO_{2eq}/MJ heat.

For biomass fuels, used as transport fuels for the purposes of the calculation referred to in point 3, the fossil fuel comparator $EC_{F(t)}$ shall be 94 gCO_{2eq}/MJ.

C. DISAGGREGATED DEFAULT VALUES FOR BIOMASS FUELS

Wood briquettes or pellets

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport	Non-CO_2 emissions from the fuel in use	Cultivation	Processing	Transport	Non-CO_2 emissions from the fuel in use
Wood chips from forest residues	1 to 500 km	0.0	1.6	3.0	0.4	0.0	1.9	3.6	0.5
	500 to 2500 km	0.0	1.6	5.2	0.4	0.0	1.9	6.2	0.5
	2500 to 10000 km	0.0	1.6	10.5	0.4	0.0	1.9	12.6	0.5
	Above 10000 km	0.0	1.6	20.5	0.4	0.0	1.9	24.6	0.5
Wood chips from SRC (Eucalyptus)	2500 to 10000 km	***4.4***	0.0	11.0	0.4	***4.4***	0.0	13.2	0.5
Wood chips from SRC (Poplar – fertilized)	1 to 500 km	3.9	0.0	3.5	0.4	3.9	0.0	4.2	0.5
	500 to 2500 km	3.9	0.0	5.6	0.4	3.9	0.0	6.8	0.5
	2500 to 10000 km	3.9	0.0	11.0	0.4	3.9	0.0	13.2	0.5
	Above 10000 km	3.9	0.0	21.0	0.4	3.9	0.0	25.2	0.5

Wood chips from SRC (Poplar – Not fertilized)	1 to 500 km	2.2	0.0	3.5	0.4	2.2	0.0	4.2	0.5
	500 to 2500 km	2.2	0.0	5.6	0.4	2.2	0.0	6.8	0.5
	2500 to 10000 km	2.2	0.0	11.0	0.4	2.2	0.0	13.2	0.5
	Above 10000 km	2.2	0.0	21.0	0.4	2.2	0.0	25.2	0.5
Wood chips from stemwood	1 to 500 km	1.1	0.3	3.0	0.4	1.1	0.4	3.6	0.5
	500 to 2500 km	1.1	0.3	5.2	0.4	1.1	0.4	6.2	0.5
	2500 to 10000 km	1.1	0.3	10.5	0.4	1.1	0.4	12.6	0.5
	Above 10000 km	1.1	0.3	20.5	0.4	1.1	0.4	24.6	0.5
Wood chips from wood industry residues	1 to 500 km	0.0	0.3	3.0	0.4	0.0	0.4	3.6	0.5
	500 to 2500 km	0.0	0.3	5.2	0.4	0.0	0.4	6.2	0.5
	2500 to 10000 km	0.0	0.3	10.5	0.4	0.0	0.4	12.6	0.5
	Above 10000 km	0.0	0.3	20.5	0.4	0.0	0.4	24.6	0.5

Wood briquettes or pellets

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	***Cultiv a***-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Wood briquettes or pellets from forest residues (case 1)	1 to 500 km	0.0	25.8	2.9	0.3	0.0	30.9	3.5	0.3
	500 to 2500 km	0.0	25.8	2.8	0.3	0.0	30.9	3.3	0.3
	2500 to 10000 km	0.0	25.8	4.3	0.3	0.0	30.9	5.2	0.3
	Above 10000 km	0.0	25.8	7.9	0.3	0.0	30.9	9.5	0.3
Wood briquettes or pellets from forest residues (case 2a)	1 to 500 km	0.0	12.5	3.0	0.3	0.0	15.0	3.6	0.3
	500 to 2500 km	0.0	12.5	2.9	0.3	0.0	15.0	3.5	0.3
	2500 to 10000 km	0.0	12.5	4.4	0.3	0.0	15.0	5.3	0.3
	Above 10000 km	0.0	12.5	8.1	0.3	0.0	15.0	9.8	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	***Cultiv a***-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Wood briquettes or pellets from forest residues (case 3a)	1 to 500 km	0.0	2.4	3.0	0.3	0.0	2.8	3.6.	0.3
	500 to 2500 km	0.0	2.4	2.9	0.3	0.0	2.8	3.5	0.3
	2500 to 10000 km	0.0	2.4	4.4	0.3	0.0	2.8	5.3	0.3
	Above 10000 km	0.0	2.4	8.2	0.3	0.0	2.8	9.8	0.3
Wood briquettes from short rotation coppice (Eucalyptus – case 1)	2500 to 10 000 km	***3.9***	24.5	4.3	0.3	***3.9***	29.4	5.2	0.3
Wood briquettes from short rotation coppice (Eucalyptus – case 2a)	2500 to 10 000 km	***5.0***	10.6	4.4	0.3	***5.0***	12.7	5.3	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	***Cultiv a***-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Wood briquettes from short rotation coppice (Eucalyptus – case 3a)	2500 to 10 000 km	***5.3***	0.3	4.4	0.3	***5.3***	0.4	5.3	0.3
Wood briquettes from short rotation coppice (Poplar – Fertilised – case 1)	1 to 500 km	3.4	24.5	2.9	0.3	3.4	29.4	3.5	0.3
	500 to 10 000 km	3.4	24.5	4.3	0.3	3.4	29.4	5.2	0.3
	Above 10000 km	3.4	24.5	7.9	0.3	3.4	29.4	9.5	0.3
Wood briquettes from short rotation coppice (Poplar – Fertilised – case 2a)	1 to 500 km	4.4	10.6	3.0	0.3	4.4	12.7	3.6	0.3
	500 to 10 000 km	4.4	10.6	4.4	0.3	4.4	12.7	5.3	0.3
	Above 10000 km	4.4	10.6	8.1	0.3	4.4	12.7	9.8	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	***Cultiv a***-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Wood briquettes from short rotation coppice (Poplar – Fertilised – case 3a)	1 to 500 km	4.6	0.3	3.0	0.3	4.6	0.4	3.6	0.3
	500 to 10 000 km	4.6	0.3	4.4	0.3	4.6	0.4	5.3	0.3
	Above 10000 km	4.6	0.3	8.2	0.3	4.6	0.4	9.8	0.3
Wood briquettes from short rotation coppice (Poplar – no fertilisation – case 1)	1 to 500 km	2.0	24.5	2.9	0.3	2.0	29.4	3.5	0.3
	500 to 2500 km	2.0	24.5	4.3	0.3	2.0	29.4	5.2	0.3
	2500 to 10 000 km	2.0	24.5	7.9	0.3	2.0	29.4	9.5	0.3
Wood briquettes from short rotation coppice (Poplar – no fertilisation – case 2a)	1 to 500 km	2.5	10.6	3.0	0.3	2.5	12.7	3.6	0.3
	500 to 10 000 km	2.5	10.6	4.4	0.3	2.5	12.7	5.3	0.3
	Above 10000 km	2.5	10.6	8.1	0.3	2.5	12.7	9.8	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	***Cultiv a***-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Wood briquettes from short rotation coppice (Poplar – no fertilisation– case 3a)	1 to 500 km	2.6	0.3	3.0	0.3	2.6	0.4	3.6	0.3
	500 to 10 000 km	2.6	0.3	4.4	0.3	2.6	0.4	5.3	0.3
	Above 10000 km	2.6	0.3	8.2	0.3	2.6	0.4	9.8	0.3
Wood briquettes or pellets from stemwood (case 1)	1 to 500 km	1.1	24.8	2.9	0.3	1.1	29.8	3.5	0.3
	500 to 2500 km	1.1	24.8	2.8	0.3	1.1	29.8	3.3	0.3
	2500 to 10000 km	1.1	24.8	4.3	0.3	1.1	29.8	5.2	0.3
	Above 10000 km	1.1	24.8	7.9	0.3	1.1	29.8	9.5	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	***Cultiv a***-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Wood briquettes or pellets from stemwood (case 2a)	1 to 500 km	1.4	11.0	3.0	0.3	1.4	13.2	3.6	0.3
	500 to 2500 km	1.4	11.0	2.9	0.3	1.4	13.2	3.5	0.3
	2500 to 10000 km	1.4	11.0	4.4	0.3	1.4	13.2	5.3	0.3
	Above 10000 km	1.4	11.0	8.1	0.3	1.4	13.2	9.8	0.3
Wood briquettes or pellets from stemwood (case 3a)	1 to 500 km	1.4	0.8	3.0	0.3	1.4	0.9	3.6	0.3
	500 to 2500 km	1.4	0.8	2.9	0.3	1.4	0.9	3.5	0.3
	2500 to 10000 km	1.4	0.8	4.4	0.3	1.4	0.9	5.3	0.3
	Above 10000 km	1.4	0.8	8.2	0.3	1.4	0.9	9.8	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	***Cultiv a***-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Wood briquettes or pellets from wood industry residues (case 1)	1 to 500 km	0.0	14.3	2.8	0.3	0.0	17.2	3.3	0.3
	500 to 2500 km	0.0	14.3	2.7	0.3	0.0	17.2	3.2	0.3
	2500 to 10000 km	0.0	14.3	4.2	0.3	0.0	17.2	5.0	0.3
	Above 10000 km	0.0	14.3	7.7	0.3	0.0	17.2	9.2	0.3
Wood briquettes or pellets from wood industry residues (case 2a)	1 to 500 km	0.0	6.0	2.8	0.3	0.0	7.2	3.4	0.3
	500 to 2500 km	0.0	6.0	2.7	0.3	0.0	7.2	3.3	0.3
	2500 to 10000 km	0.0	6.0	4.2	0.3	0.0	7.2	5.1	0.3
	Above 10000 km	0.0	6.0	7.8	0.3	0.0	7.2	9.3	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultiva-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	***Cultiv a***-tion	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Wood briquettes or pellets from wood industry residues (case 3a)	1 to 500 km	0.0	0.2	2.8	0.3	0.0	0.3	3.4	0.3
	500 to 2500 km	0.0	0.2	2.7	0.3	0.0	0.3	3.3	0.3
	2500 to 10000 km	0.0	0.2	4.2	0.3	0.0	0.3	5.1	0.3
	Above 10000 km	0.0	0.2	7.8	0.3	0.0	0.3	9.3	0.3

Agriculture pathways

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultivation	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	Cultivation	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Agricultural Residues with density <0.2 t/m3	1 to 500 km	0.0	0.9	2.6	0.2	0.0	1.1	3.1	0.3
	500 to 2500 km	0.0	0.9	6.5	0.2	0.0	1.1	7.8	0.3
	2500 to 10 000 km	0.0	0.9	14.2	0.2	0.0	1.1	17.0	0.3
	Above 10000 km	0.0	0.9	28.3	0.2	0.0	1.1	34.0	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultivation	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	Cultivation	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Agricultural Residues with density > 0.2 t/m3	1 to 500 km	0.0	0.9	2.6	0.2	0.0	1.1	3.1	0.3
	500 to 2500 km	0.0	0.9	3.6	0.2	0.0	1.1	4.4	0.3
	2500 to 10 000 km	0.0	0.9	7.1	0.2	0.0	1.1	8.5	0.3
	Above 10000 km	0.0	0.9	13.6	0.2	0.0	1.1	16.3	0.3
Straw pellets	1 to 500 km	0.0	5.0	3.0	0.2	0.0	6.0	3.6	0.3
	500 to 10000 km	0.0	5.0	4.6	0.2	0.0	6.0	5.5	0.3
	Above 10000 km	0.0	5.0	8.3	0.2	0.0	6.0	10.0	0.3

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)				Default greenhouse gas emissions (gCO_{2eq}/MJ)			
		Cultivation	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use	Cultivation	Processing	Transport & distribution	Non-CO_2 emissions from the fuel in use
Bagasse briquettes	500 to 10 000 km	0.0	0.3	4.3	0.4	0.0	0.4	5.2	0.5
	Above 10 000 km	0.0	0.3	8.0	0.4	0.0	0.4	9.5	0.5
Palm Kernel Meal	Above 10000 km	21.6	21.1	11.2	0.2	21.6	25.4	13.5	0.3
Palm Kernel Meal (no CH_4 emissions from oil mill)	Above 10000 km	21.6	3.5	11.2	0.2	21.6	4.2	13.5	0.3

Disaggregated default values for biogas for electricity production

Biomass fuel production system		Technology	TYPICAL [gCO_{2eq}/MJ]					DEFAULT [gCO_{2eq}/MJ]				
			Cultiva-tion	Proces-sing	Non-CO_2 emissions from the fuel in use	Trans-port	Manure credits	Cultiva-tion	Proces-sing	Non-CO_2 emissions from the fuel in use	Trans-port	Manure credits
Wet manure[1]	case 1	Open digestate	0.0	69.6	8.9	0.8	-107.3	0.0	97.4	12.5	0.8	-107.3
		Close digestate	0.0	0.0	8.9	0.8	-97.6	0.0	0.0	12.5	0.8	-97.6
	case 2	Open digestate	0.0	74.1	8.9	0.8	-107.3	0.0	103.7	12.5	0.8	-107.3
		Close digestate	0.0	4.2	8.9	0.8	-97.6	0.0	5.9	12.5	0.8	-97.6
	case 3	Open digestate	0.0	83.2	8.9	0.9	-120.7	0.0	116.4	12.5	0.9	-120.7
		Close digestate	0.0	4.6	8.9	0.8	-108.5	0.0	6.4	12.5	0.8	-108.5

[1] The values for biogas production from manure include negative emissions for emissions saved from raw manure management. The value of esca considered is equal to -45 gCO_{2eq}/MJ manure used in anaerobic digestion

Biomass fuel production system		Technology	TYPICAL [gCO_{2eq}/MJ]					DEFAULT [gCO_{2eq}/MJ]				
			Cultiva-tion	Proces-sing	Non-CO_2 emissions from the fuel in use	Trans-port	Manure credits	Cultiva-tion	Proces-sing	Non-CO_2 emissions from the fuel in use	Trans-port	Manure credits
Maize whole plant[1]	case 1	Open digestate	15.6	13.5	8.9	***0.0***[2]	-	15.6	18.9	12.5	0.0	-
		Close digestate	15.2	0.0	8.9	0.0	-	15.2	0.0	12.5	0.0	-
	case 2	Open digestate	15.6	18.8	8.9	0.0	-	15.6	26.3	12.5	0.0	-
		Close digestate	15.2	5.2	8.9	0.0	-	15.2	7.2	12.5	0.0	-
	case 3	Open digestate	17.5	21.0	8.9	0.0	-	17.5	29.3	12.5	0.0	-
		Close digestate	17.1	5.7	8.9	0.0	-	17.1	7.9	12.5	0.0	-

[1] Maize whole plant should be interpreted as maize harvested as fodder and ensiled for preservation.

[2] Transport of agricultural raw materials to the transformation plant is, according to the methodology in COM(2010) 11, included in the 'cultivation' value. The value for transport of maize silage accounts for 0.4 gCO_{2eq}/MJ biogas.

Biomass fuel production system		Technology	TYPICAL [gCO_{2eq}/MJ]					DEFAULT [gCO_{2eq}/MJ]				
			Cultiva-tion	Proces-sing	Non-CO_2 emissions from the fuel in use	Trans-port	Manure credits	Cultiva-tion	Proces-sing	Non-CO_2 emissions from the fuel in use	Trans-port	Manure credits
Biowaste	case 1	Open digestate	0.0	21.8	8.9	0.5	-	0.0	30.6	12.5	0.5	-
		Close digestate	0.0	0.0	8.9	0.5	-	0.0	0.0	12.5	0.5	-
	case 2	Open digestate	0.0	27.9	8.9	0.5	-	0.0	39.0	12.5	0.5	-
		Close digestate	0.0	5.9	8.9	0.5	-	0.0	8.3	12.5	0.5	-
	case 3	Open digestate	0.0	31.2	8.9	0.5	-	0.0	43.7	12.5	0.5	-
		Close digestate	0.0	6.5	8.9	0.5	-	0.0	9.1	12.5	0.5	-

Disaggregated default values for biomethane

Biomethane production system	Technological option		TYPICAL [gCO_{2eq}/MJ]						DEFAULT [gCO_{2eq}/MJ]					
			Cultiva-tion	Proces-sing	Up-grading	Trans-port	Compres-sion at filling station	Manure credits	Cultiva-tion	Proces-sing	Up-grading	Trans-port	Compres-sion at filling station	Manure credits
Wet manure	Open digestate	no off-gas combustion	0.0	84.2	19.5	1.0	3.3	-124.4	0.0	117.9	27.3	1.0	4.6	-124.4
		off-gas combustion	0.0	84.2	4.5	1.0	3.3	-124.4	0.0	117.9	6.3	1.0	4.6	-124.4
	Close digestate	no off-gas combustion	0.0	3.2	19.5	0.9	3.3	-111.9	0.0	4.4	27.3	0.9	4.6	-111.9
		off-gas combustion	0.0	3.2	4.5	0.9	3.3	-111.9	0.0	4.4	6.3	0.9	4.6	-111.9
Maize whole plant	Open digestate	no off-gas combustion	18.1	20.1	19.5	0.0	3.3	-	18.1	28.1	27.3	0.0	4.6	-
		off-gas combustion	18.1	20.1	4.5	0.0	3.3	-	18.1	28.1	6.3	0.0	4.6	-
	Close digestate	no off-gas combustion	17.6	4.3	19.5	0.0	3.3	-	17.6	6.0	27.3	0.0	4.6	-
		off-gas combustion	17.6	4.3	4.5	0.0	3.3	-	17.6	6.0	6.3	0.0	4.6	-

Biomethane production system	Technological option		TYPICAL [gCO_{2eq}/MJ]						DEFAULT [gCO_{2eq}/MJ]					
			Cultiva-tion	Proces-sing	Up-grading	Trans-port	Compres-sion at filling station	Manure credits	Cultiva-tion	Proces-sing	Up-grading	Trans-port	Compres-sion at filling station	Manure credits
Biowaste	Open digestate	no off-gas combustion	0.0	30.6	19.5	0.6	3.3	-	0.0	42.8	27.3	0.6	4.6	-
		off-gas combustion	0.0	30.6	4.5	0.6	3.3	-	0.0	42.8	6.3	0.6	4.6	-
	Close digestate	no off-gas combustion	0.0	5.1	19.5	0.5	3.3	-	0.0	7.2	27.3	0.5	4.6	-
		off-gas combustion	0.0	5.1	4.5	0.5	3.3	-	0.0	7.2	6.3	0.5	4.6	-

D. TOTAL TYPICAL AND DEFAULT GREENHOUSE GAS EMISSION VALUES FOR BIOMASS FUEL PATHWAYS

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Woodchips from forest residues	1 to 500 km	5	6
	500 to 2500 km	7	9
	2500 to 10 000 km	12	15
	Above 10000 km	22	27
Woodchips from short rotation coppice (Eucalyptus)	2500 to 10 000 km	***16***	***18***
Woodchips from short rotation coppice (Poplar - Fertilised)	1 to 500 km	8	9
	500 to 2500 km	10	11
	2500 to 10 000 km	15	18
	2500 to 10 000 km	25	30
Woodchips from short rotation coppice (Poplar – No fertilisation)	1 to 500 km	6	7
	500 to 2500 km	8	10
	2500 to 10 000 km	14	16
	2500 to 10 000 km	24	28
Woodchips from stemwood	1 to 500 km	5	6
	500 to 2500 km	7	8
	2500 to 10 000 km	12	15
	2500 to 10 000 km	22	27

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Woodchips from industry residues	1 to 500 km	4	5
	500 to 2500 km	6	7
	2500 to 10 000 km	11	13
	Above 10000 km	21	25
Wood briquettes or pellets from forest residues (case 1)	1 to 500 km	29	35
	500 to 2500 km	29	35
	2500 to 10000 km	30	36
	Above 10000 km	34	41
Wood briquettes or pellets from forest residues (case 2a)	1 to 500 km	16	19
	500 to 2500 km	16	19
	2500 to 10000 km	17	21
	Above 10000 km	21	25
Wood briquettes or pellets from forest residues (case 3a)	1 to 500 km	6	7
	500 to 2500 km	6	7
	2500 to 10000 km	7	8
	Above 10000 km	11	13
Wood briquettes or pellets from short rotation coppice (Eucalyptus – case 1	2500 to 10 000 km	***33***	***39***
Wood briquettes or pellets from short rotation coppice (Eucalyptus – case 2a)	2500 to 10 000 km	***20***	***23***
Wood briquettes or pellets from short rotation coppice (Eucalyptus – case 3a)	2500 to 10 000 km	***10***	***11***

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Wood briquettes or pellets from short rotation coppice (Poplar – Fertilised – case 1)	1 to 500 km	31	37
	500 to 10000 km	32	38
	Above 10000 km	36	43
Wood briquettes or pellets from short rotation coppice (Poplar – Fertilised – case 2a)	1 to 500 km	18	21
	500 to 10000 km	20	23
	Above 10000 km	23	27
Wood briquettes or pellets from short rotation coppice (Poplar – Fertilised – case 3a	1 to 500 km	8	9
	500 to 10000 km	10	11
	Above 10000 km	13	15
Wood briquettes or pellets from short rotation coppice (Poplar – no fertilisation – case 1)	1 to 500 km	30	35
	500 to 10000 km	31	37
	Above 10000 km	35	41
Wood briquettes or pellets from short rotation coppice (Poplar – no fertilisation – case 2a)	1 to 500 km	16	19
	500 to 10000 km	18	21
	Above 10000 km	21	25

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Wood briquettes or pellets from short rotation coppice (Poplar – no fertilisation – case 3a	1 to 500 km	6	7
	500 to 10000 km	8	9
	Above 10000 km	11	13
Wood briquettes or pellets from stemwood (case 1)	1 to 500 km	29	35
	500 to 2500 km	29	34
	2500 to 10000 km	30	36
	Above 10000 km	34	41
Wood briquettes or pellets from stemwood (case 2a)	1 to 500 km	16	18
	500 to 2500 km	15	18
	2500 to 10000 km	17	20
	Above 10000 km	21	25
Wood briquettes or pellets from stemwood (case 3a)	1 to 500 km	5	6
	500 to 2500 km	5	6
	2500 to 10000 km	7	8
	Above 10000 km	11	12
Wood briquettes or pellets from wood industry residues (case 1)	1 to 500 km	17	21
	500 to 2500 km	17	21
	2500 to 10000 km	19	23
	Above 10000 km	22	27

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Wood briquettes or pellets from wood industry residues (case 2a)	1 to 500 km	9	11
	500 to 2500 km	9	11
	2500 to 10000 km	10	13
	Above 10000 km	14	17
Wood briquettes or pellets from wood industry residues (case 3a)	1 to 500 km	3	4
	500 to 2500 km	3	4
	2500 to 10000	5	6
	Above 10000 km	8	10

Case 1 refers to processes in which a Natural Gas boiler is used to provide the process heat to the pellet mill. Process electricity is purchased from the grid.

Case 2 refers to processes in which a boiler fuelled with wood chips is used to provide the process heat to the pellet mill. Process electricity is purchased from the grid.

Case 3 refers to processes in which a CHP, fuelled with wood chips, is used to provide heat and power to the pellet mill.

Biomass fuel production system	Transport distance	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
Agricultural Residues with density <0.2 t/m3[1]	1 to 500 km	4	4
	500 to 2500 km	8	9
	2500 to 10 000 km	15	18
	Above 10000 km	29	35
Agricultural Residues with density > 0.2 t/m3[2]	1 to 500 km	4	4
	500 to 2500 km	5	6
	2500 to 10 000 km	8	10
	Above 10000 km	15	18
Straw pellets	1 to 500 km	8	10
	500 to 10000 km	10	12
	Above 10000 km	14	16
Bagasse briquettes	500 to 10 000 km	5	6
	Above 10 000 km	9	10
Palm Kernel Meal	Above 10000 km	54	61
Palm Kernel Meal (no CH_4 emissions from oil mill)	Above 10000 km	37	40

[1] This group of materials includes agricultural residues with a low bulk density and it comprises materials such as straw bales, oat hulls, rice husks and sugar cane bagasse bales (not exhaustive list).

[2] The group of agricultural residues with higher bulk density includes materials such as corn cobs, nut shells, soybean hulls, palm kernel shells (not exhaustive list).

Typical and default values - biogas for electricity

Biogas production system	Technological option		Typical value	Default value
			GHG emissions ($g CO_{2eq}/MJ$)	GHG emissions ($g CO_{2eq}/MJ$)
Biogas for electricity from wet manure	Case 1	Open digestate[1]	-28	3
		Close digestate[2]	-88	-84
	Case 2	Open digestate	-23	10
		Close digestate	-84	-78
	Case 3	Open digestate	-28	9
		Close digestate	-94	-89
Biogas for electricity from maize whole plant	Case 1	Open digestate	38	47
		Close digestate	24	28
	Case 2	Open digestate	43	54
		Close digestate	29	35
	Case 3	Open digestate	47	59
		Close digestate	32	38
Biogas for electricity from biowaste	Case 1	Open digestate	31	44
		Close digestate	9	13
	Case 2	Open digestate	37	52
		Close digestate	15	21
	Case 3	Open digestate	41	57
		Close digestate	16	22

[1] Open storage of digestate accounts for additional emissions of methane which change with the weather, the substrate and the digestion efficiency. In these calculations the amounts are taken to be equal to 0.05 MJCH4 / MJbiogas for manure, 0.035 MJCH4 / MJbiogas for maize and 0.01 MJCH4 / MJbiogas for biowaste.

[2] Close storage means that the digestate resulting from the digestion process is stored in a gas tight tank and the additional biogas released during storage is considered to be recovered for production of additional electricity or biomethane.

Typical and default values for biomethane

Biomethane production system	Technological option	Typical greenhouse gas emissions (g CO_{2eq}/MJ)	Default greenhouse gas emissions (g CO_{2eq}/MJ)
Biomethane from wet manure	Open digestate, no off-gas combustion[1]	-20	22
	Open digestate, off-gas combustion[2]	-35	1
	Close digestate, no off-gas combustion	-88	-79
	Close digestate, off-gas combustion	-103	-100
Biomethane from maize whole plant	Open digestate , no off-gas combustion	58	73
	Open digestate, off-gas combustion	43	52
	Close digestate, no off-gas combustion	41	51
	Close digestate, off-gas combustion	26	30
Biomethane from biowaste	Open digestate , no off-gas combustion	51	71
	Open digestate, off-gas combustion	36	50
	Close digestate, no off-gas combustion	25	35
	Close digestate, off-gas combustion	10	14

[1] This category includes the following categories of technologies for biogas upgrade to biomethane: Pressure Swing Adsorption (PSA), Pressure Water Scrubbing (PWS), Membranes, Cryogenic, and Organic Physical Scrubbing (OPS). It includes an emission of 0.03 MJCH4/MJbiomethane for the emission of methane in the off-gases.

[2] This category includes the following categories of technologies for biogas upgrade to biomethane: Pressure Water Scrubbing (PWS) when water is recycled, Pressure Swing Adsorption (PSA), Chemical Scrubbing, Organic Physical Scrubbing (OPS), Membranes and Cryogenic upgrading. No methane emissions are considered for this category (the methane in the off-gas is combusted, if any).

Typical and default values - biogas for electricity - mixtures of manure and maize: GHG emissions with shares given on a fresh mass basis

Biogas production system		Technological options	Typical greenhouse gas emissions ($g\ CO_{2eq}/MJ$)	Default greenhouse gas emissions ($g\ CO_{2eq}/MJ$)
Manure – Maize 80 % - 20 %	Case 1	Open digestate	17	33
		Close digestate	-12	-9
	Case 2	Open digestate	22	40
		Close digestate	-7	-2
	Case 3	Open digestate	23	43
		Close digestate	-9	-4
Manure – Maize 70 % - 30 %	Case 1	Open digestate	24	37
		Close digestate	0	3
	Case 2	Open digestate	29	45
		Close digestate	4	10
	Case 3	Open digestate	31	48
		Close digestate	4	10
Manure – Maize 60 % - 40 %	Case 1	Open digestate	28	40
		Close digestate	7	11
	Case 2	Open digestate	33	47
		Close digestate	12	18
	Case 3	Open digestate	36	52
		Close digestate	12	18

Comments

Case 1 refers to pathways in which power and heat required in the process are supplied by the CHP engine itself.

Case 2 refers to pathways in which the electricity required in the process is taken from the grid and the process heat is supplied by the CHP engine itself. In some Member States, operators are not allowed to claim the gross production for subsidies and Case 1 is the more likely configuration.

Case 3 refers to pathways in which the electricity required in the process is taken from the grid and the process heat is supplied by a biogas boiler. This case applies to some installations in which the CHP engine is not on-site and biogas is sold (but not upgraded to biomethane).

Typical and default values – biomethane - mixtures of manure and maize: GHG emissions with shares given on a fresh mass basis

Biomethane production system	Technological options	Typical	Default
		(g CO_{2eq}/MJ)	(g CO_{2eq}/MJ)
Manure – Maize 80 % - 20 %	Open digestate, no off-gas combustion	32	57
	Open digestate, off-gas combustion	17	36
	Close digestate, no off-gas combustion	-1	9
	Close digestate, off-gas combustion	-16	-12
Manure – Maize 70 % - 30 %	Open digestate, no off-gas combustion	41	62
	Open digestate, off-gas combustion	26	41
	Close digestate, no off-gas combustion	13	22
	Close digestate, off-gas combustion	-2	1
Manure – Maize 60 % - 40 %	Open digestate, no off-gas combustion	46	66
	Open digestate, off-gas combustion	31	45
	Close digestate, no off-gas combustion	22	31
	Close digestate, off-gas combustion	7	10

In case of biomethane used as Compressed Biomethane as a transport fuel, a value of 3.3 gCO_{2eq}/MJ biomethane needs to be added to the typical values and a value of 4.6 gCO_{2eq}/MJ biomethane to the Default values.

ANNEX VII

Accounting of energy from heat pumps

The amount of aerothermal, geothermal or hydrothermal energy captured by heat pumps to be considered energy from renewable sources for the purposes of this Directive, E_{RES}, shall be calculated in accordance with the following formula:

$E_{RES} = Q_{usable} * (1 – 1/SPF)$

where

– Q_{usable} = the estimated total usable heat delivered by heat pumps fulfilling the criteria referred to in Article 7 (4), implemented as follows: Only heat pumps for which SPF > 1,15 * 1/η shall be taken into account,

– SPF = the estimated average seasonal performance factor for those heat pumps,

– η is the ratio between total gross production of electricity and the primary energy consumption for electricity production and shall be calculated as an EU average based on Eurostat data.

ANNEX VIII

PART A. PROVISIONAL ESTIMATED INDIRECT LAND-USE CHANGE EMISSIONS FROM BIOFUEL AND BIOLIQUID FEEDSTOCKS (GCO_{2EQ}/MJ)[48]

Feedstock group	Mean[1]	Interpercentile range derived from the sensitivity analysis[2]
Cereals and other starch-rich crops	12	8 to 16
Sugars	13	4 to 17
Oil crops	55	33 to 66

1 The mean values included here represent a weighted average of the individually modelled feedstock values.

2 The range included here reflects 90 % of the results using the fifth and ninety-fifth percentile values resulting from the analysis. The fifth percentile suggests a value below which 5 % of the observations were found (i.e. 5 % of total data used showed results below 8, 4, and 33 gCO_{2eq}/MJ). The ninety-fifth percentile suggests a value below which 95 % of the observations were found (i.e. 5 % of total data used showed results above 16, 17, and 66 gCO_{2eq}/MJ).

PART B. BIOFUELS AND BIOLIQUIDS FOR WHICH THE ESTIMATED INDIRECT LAND-USE CHANGE EMISSIONS ARE CONSIDERED TO BE ZERO

Biofuels and bioliquids produced from the following feedstock categories will be considered to have estimated indirect land-use change emissions of zero:

(1) feedstocks which are not listed under part A of this Annex.

(2) feedstocks, the production of which has led to direct land-use change, i.e. a change from one of the following IPCC land cover categories: forest land, grassland, wetlands, settlements, or other land, to cropland or perennial cropland[1] . In such a case a direct land-use change emission value (e_l) should have been calculated in accordance with point 7 of part C of Annex V.

[1] Perennial crops are defined as multi-annual crops, the stem of which is usually not annually harvested such as short rotation coppice and oil palm.

ANNEX IX

Part A. Feedstocks for the production of advanced biofuels***, the contribution of which towards the target referred to in the first and second subparagraph of Article 25(1) may be considered to be twice their energy content***

(a) Algae if cultivated on land in ponds or photobioreactors.

(b) Biomass fraction of mixed municipal waste, but not separated household waste subject to recycling targets under point (a) of Article 11(2) of Directive 2008/98/EC.

(c) Bio-waste as defined in Article 3(4) of Directive 2008/98/EC from private households subject to separate collection as defined in Article 3(11) of that Directive.

(d) Biomass fraction of industrial waste not fit for use in the food or feed chain, including material from retail and wholesale and the agro-food and fish and aquaculture industry, and excluding feedstocks listed in part B of this Annex.

(e) Straw.

(f) Animal manure and sewage sludge.

(g) Palm oil mill effluent and empty palm fruit bunches.

(h) Tall oil ▌pitch.

(i) Crude glycerine.

(j) Bagasse.

(k) Grape marcs and wine lees.

(l) Nut shells.

(m) Husks.

(n) Cobs cleaned of kernels of corn.

(o) Biomass fraction of wastes and residues from forestry and forest-based industries, i.e. bark, branches, pre-commercial thinnings, leaves, needles, tree tops, saw dust, cutter shavings, black liquor, brown liquor, fibre sludge, lignin ***and tall oil***.

(p) Other non-food cellulosic material as defined in point (***r***) of the second paragraph of Article 2.

(q) Other ligno-cellulosic material as defined in point (***q***) of the second paragraph of Article 2 except saw logs and veneer logs.

Part B. Feedstocks for the production of biofuels, the contribution of which towards the target established in Article 25(1) ***shall be*** limited ***and may be considered to be twice their energy content***

(a) Used cooking oil.

(b) Animal fats classified as categories 1 and 2 in accordance with Regulation (EC) No 1069/2009 of the European Parliament and of the Council[1]

▌

[1] Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation) (OJ L 300, 14.11.2009, p. 1).

ANNEX XI

Part A

Repealed Directive with list of the successive amendments thereto (referred to in Article 34)

Directive 2009/28/EC of the European Parliament and of the Council (OJ L 140, 5.6.2009, p. 16)	
Council Directive 2013/18/EU (OJ L 158, 10.6.2013, p. 230)	
Directive (EU) 2015/1513 (OJ L 239, 15.9.2015, p. 1)	Only Article 2

Part B

Time-limits for transposition into national law

(referred to in Article 34)

Directive	Time-limit for transposition
2009/28/EC	25 June 2009
2013/18/EU	1 July 2013
(EU) 2015/1513	10 September 2017

ANNEX XII

Annex XII to be adjusted in the course of lawyer-linguists corrections.

Correlation table

Directive 2009/28/EC	This Directive
Article 1	Article 1
Article 2, first subparagraph	Article 2, first subparagraph
Article 2, second subparagraph, introductory wording	Article 2, second subparagraph, introductory wording
Article 2, second subparagraph, point a	Article 2, second subparagraph, point a
Article 2, second subparagraph, points b, c and d	—
—	Article 2, second subparagraph, point b
Article 2, second subparagraph, points e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v and w	Article 2, second subparagraph, points c, d, e, f ,g, h, i ,j, k, l, m ,n, o, p, q, r, s, t and u
—	Article 2, second subparagraph, points x, y, z, aa, bb, cc, dd, ee, ff, gg, hh, ii, jj, kk, ll, mm, nn, oo, pp, qq, rr, ss, tt and uu
Article 3	—
—	Article 3
Article 4	—
—	Article 4
—	Article 5
—	Article 6
Article 5, paragraph 1, subparagraphs 1, 2 and 3	Article 7, paragraph 1, subparagraphs 1, 2 and 3
—	Article 7, paragraph 1, subparagraph 4
Article 5, paragraph 2	—
Article 5, paragraphs 3 and 4	Article 7, paragraphs 2 and 3
—	Article 7, paragraphs 4 and 5
Article 5, paragraphs 5, 6 and 7	Article 7, paragraphs 6, 7 and 8
Article 6	Article 8
Article 7	Article 9
Article 8	Article 10
Article 9	Article 11

Directive 2009/28/EC	This Directive
Article 10	Article 12
Article 11	Article 13
Article 12	Article 14
Article 13, paragraph 1, subparagraph 1	Article 15, paragraph 1, subparagraph 1
Article 13, paragraph 1, subparagraph 2	Article 15, paragraph 1, subparagraph 2
Article 13, paragraph 1, subparagraph 2, points a and b	—
Article 13, paragraph 1, subparagraph 2, points c, d ,e and f	Article 15, paragraph 1, subparagraph 2, points a, b, c and d
Article 13, paragraph 2	Article 15, paragraph 2
—	Article 15, paragraph 3
Article 13, paragraphs 3, 4 and 5	Article 15, paragraphs 4, 5 and 6
Article 13, paragraph 6, first subparagraph	Article 15, paragraph 7, first subparagraph
Article 13, paragraph 6, subparagraphs 2,3,4 and 5	—
—	Article 15, paragraphs 8 and 9
—	Article 16
—	Article 17
Article 14	Article 18
Article 15, paragraphs 1 and 2	Article 19, paragraphs 1 and 2
Article 15, paragraph 3	—
—	Article 19, paragraphs 3 and 4
Article 15, paragraphs 4 and 5	Article 19, paragraphs 5 and 6
Article 15, paragraph 6, first subparagraph, point a	Article 19, paragraph 7, first subparagraph, point a
Article 15, paragraph 6, first subparagraph, point b (i)	Article 19, paragraph 7, first subparagraph, point b (i)
—	Article 19, paragraph 7, first subparagraph, point b (ii)
Article 15, paragraph 6, first subparagraph, point b (ii)	Article 19, paragraph 7, first subparagraph, point b (iii)
—	Article 19, paragraph 7, second subparagraph
Article 15, paragraph 7	Article 19, paragraph 8
Article 15, paragraph 8	—

Directive 2009/28/EC	This Directive
Article 15, paragraphs 9 and 10	Article 19, paragraphs 9 and 10
—	Article 19, paragraph 11
Article 15, paragraphs 11 and 12	Article 19, paragraphs 12 and 13
	Article 19, paragraph 14
Article 16, paragraphs 1, 2, 3, 4, 5, 6, 7 and 8	—
Article 16, paragraphs 9, 10 and 11	Article 20, paragraphs 1, 2 and 3
—	Article 21
—	Article 22
—	Article 23
—	Article 24
—	Article 25
Article 17, paragraph 1, first and second subparagraphs	Article 26, paragraph 1, first and second subparagraphs
—	Article 26, paragraph 1, third and fourth subparagraphs
Article 17, paragraph 2, first and second subparagraphs	—
Article 17, paragraph 2, third subparagraph	Article 26, paragraph 7, third subparagraph
Article 17, paragraph 3, first subparagraph	Article 26, paragraph 2, first subparagraph
—	Article 26, paragraph 2, second subparagraph
Article 17, paragraph 4	Article 26, paragraph 3
Article 17, paragraph 5	Article 26, paragraph 4
Article 17, paragraphs 6 and 7	—
Article 17, paragraph 8	Article 26, paragraph 9
Article 17, paragraph 9	—
—	Article 26, paragraphs 5, 6 and 8
—	Article 26, paragraph 7, first and second subparagraphs
—	Article 26, paragraph 10
Article 18, paragraph 1, first subparagraph	Article 27, paragraph 1, first subparagraph
Article 18, paragraph 1, first subparagraph, point a, b and c	Article 27, paragraph 1, first subparagraph, points a, c and d
—	Article 27, paragraph 1, first subparagraph, point b

Directive 2009/28/EC	This Directive
Article 18, paragraph 2	—
—	Article 27, paragraph 2
Article 18, paragraph 3, first subparagraph	Article 27, paragraph 3, first subparagraph
Article 18, paragraph 3, second and third subparagraphs	—
Article 18, paragraph 3, fourth and fifth subparagraphs	Article 27, paragraph 3, second and third subparagraphs
Article 18, paragraph 4, first subparagraph	—
Article 18, paragraph 4, second and third subparagraphs	Article 27, paragraph 4, first and second subparagraphs
Article 18, paragraph 4, fourth subparagraph	—
Article 18, paragraph 5	Article 27, paragraph 5
Article 18, paragraph 6, first and second subparagraphs	Article 27, paragraph 6, first and second subparagraphs
Article 18, paragraph 6, third subparagraph	—
Article 18, paragraph 6, fourth subparagraph	Article 27, paragraph 6, third subparagraph
—	Article 27, paragraph 6, fourth subparagraph
Article 18, paragraph 6, fifth subparagraph	Article 27, paragraph 6, fifth subparagraph
Article 18, paragraph 7, first subparagraph	Article 27, paragraph 7, first subparagraph
—	Article 27, paragraph 7, second subparagraph
Article 18, paragraphs 8 and 9	—
Article 19, paragraph 1, first subparagraph	Article 28, paragraph 1, first subparagraph
Article 19, paragraph 1, first subparagraph, point a, b and c	Article 28, paragraph 1, first subparagraph, point a, b and c
—	Article 28 paragraph 1, first subparagraph, point d
Article 19, paragraph 2, 3 and 4	Article 28, paragraph 2, 3 and 4
Article 19, paragraph 5	—
Article 19, paragraph 7, first subparagraph	Article 28, paragraph 5, first subparagraph
Article 19, paragraph 7, first subparagraph, first, second third and fourth indents	—
Article 19, paragraph 7, second subparagraph	Article 28, paragraph 5, second subparagraph
Article 19, paragraph 7, third subparagraph, introductory words	Article 28, paragraph 5, third subparagraph

Directive 2009/28/EC	This Directive
Article 19, paragraph 7, third subparagraph, point a	Article 28, paragraph 5, third subparagraph
Article 19, paragraph 7, third subparagraph, point b	—
Article 19, paragraph 8	Article 28, paragraph 6
Article 20	Article 29
Article 22	—
Article 23, paragraphs 1 and 2	Article 30, paragraphs 1 and 2
Article 23, paragraphs 3, 4, 5, 6, 7 and 8	—
Article 23, paragraph 9	Article 30, paragraph 3
Article 23, paragraph 10	Article 30, paragraph 4
Article 24	—
Article 25, paragraph 1	Article 31, paragraph 1
Article 25, paragraph 2	—
Article 25, paragraph 3	Article 31, paragraph 2
Article 25a, paragraphs 1, 2, 3, 4 and 5	Article 32, paragraphs 1, 2, 3, 5 and 6
—	Article 32, paragraph 4
Article 26	—
Article 27	Article 33
—	Article 34
Article 28	Article 35
Article 29	Article 36
Annex I	Annex I
Annex II	Annex II
Annex III	Annex III
Annex IV	Annex IV
Annex V	Annex V
Annex VI	—
—	Annex VI

Directive 2009/28/EC	This Directive
Annex VII	Annex VII
Annex VIII	Annex VIII
Annex IX	Annex IX
—	Annex X
—	Annex XI
—	Annex XII