European Commission

Sub Group on Advanced Biofuels

Sustainable Transport Forum

Building up the future

Terminology and Glossary
With common abbreviations & conversion factors

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European Union/Eurostat

International Energy Agency – Bioenergy Implementing Agreement

International Energy Agency

International Standardization Organization

Military Specifications

ABBREVIATIONS

1G	:	First generation Biofuel
2G	:	Second generation Biofuel
3G		Third generation Biofuel
ABE	:	Acetone-Butanol-Ethanol
AD	:	anaerobic digestion
ASJ	:	Alcohols to Synthetic Jet
ASTM	:	American Society for Testing and Materials
ATJ	:	Alcohol to Jet
BA	:	British Airways
bbl	:	Barrel, typically used volume as reference for oil price
BLG	:	Black Liquor Gasification
bpd	:	Barrels per day
BTL	:	Biomass-to-Liquids
Btu	:	British Thermal Unit
CAAFI	:	Commercial Aviation Alternative Fuels Initiative
CAPEX	:	Capital Expenditure
CCS	:	Carbon Capture and Storage
CCU	:	Carbon Capture and Utilization
CDM	:	Clean Development Mechanism
CEN	:	European Committee for Standardization
CFB	:	Circulating Fluidized Bed
CHP	:	Combined Heat and Power
CHVO	:	Co-processed hydrotreated vegetable oil
CNG	:	Compressed Natural Gas
CNGV	:	CNG Vehicle
CORSIA	:	Carbon Offsetting and Reduction Scheme for International Aviation
CTL	:	Coal-To-Liquid
DDGS	:	Dried Distiller's Grains with Solubles
DLUC	:	Direct Land Use Change
DM	:	Dry Matter
DME	:	Dimethyl Ether
DPHEV	:	Diesel plug-in hybrid electric vehicle
DSHC	:	Direct Sugar to Hydrocarbons
EBA	:	European Biogas Association
EBTP	:	European Biofuels Technology Platform
EC	:	European Commission
e-fuels	:	fuels based on the use of renewable electricity
EGFTF	:	Expert Group on Future Transport Fuels
EIBI		European Industrial Bioenergy Initiative
E85	:	E85 fuel, 85%vol Ethanol
E95	:	E95 fuel, 95%vol Ethanol, remainder mainly ignition enhancer
EPA	:	Environmental Protection Agency
EtOH	:	Ethanol
ETBE	:	Ethyl Tertiary Butyl Ether
ETS	:	Emissions Trading Scheme
EU	:	European Union
EV	:	Electric Vehicle
FAME	:	Fatty Acid Methyl Esters
FAEE	:	Fatty Acid Ethyl Esters
FCC	:	Fluid Catalytic Cracking
FFV	:	Flexible Fuel Vehicle
FOAK	:	First of a Kind

FQD	:	Fuel Quality Directive
FT	:	Fisher-Tropsch
ge	:	gasoline equivalent
GHG	:	Greenhouse Gas(es)
GTL	:	Gas-To-Liquid
HD	:	Heavy Duty
HDCJ	:	Hydrotreated Depolymerized Cellulosic Jet
HDO-SAK	:	Hydro-Deoxygenated Synthesized Aromatic Kerosene
HDO-SK	:	Hydro-Deoxygenated Synthesized Kerosene
HDV	:	Heavy Duty Vehicle
HEFA	:	Hydrogenated Ether and Fatty Acids
HTL	:	Hydrothermal Liquefaction
HVO	:	Hydrotreated/Hydrogenated Vegetable Oil
IATA	:	International Air Transport Association
ICAO	:	International Civil Aviation Organisation
ICE	:	Internal Combustion Engine
IEA	:	International Energy Agency
ILUC	:	Indirect Land Use Change
IMO	:	International Maritime Organization
IRENA	:	International Renewable Energy Agency
ISO	:	International Organization for Standardization
JEC	:	EC Joint Research Centre (JRC) , EUCAR and CONCAWE
LCA	:	Life-cycle assessment.
LCF	:	Low Carbon Fuels
LCFF	:	Low Carbon Fossil Fuel
LCO	:	Light Cycle Oil
LDV	:	Light Duty Vehicle
LHV	:	Lower Heating Value
LNG	:	Liquefied Natural Gas
LPG	:	Liquefied Petroleum Gas
LUC	:	Land-Use Change
MARPOL		International Convention for the Prevention of Pollution from Ships
MCAD	:	million Canadian Dollars
MeOH	:	Methanol
MESP	:	Minimum cellulosic Ethanol Selling Price
MJ	:	Mega Joule
MMt	:	Million Metric tons
MS	:	Member state
MSEK	:	million Swedish Crowns
MSW	:	Municipal Solid Waste
mt	:	Metric Tons
MTBE	:	Methyl Tert-Butyl ether
MtG	:	Methanol to Gasoline
Mtoe	:	Million tons of oil equivalent
NGOs	:	Non-Government Organizations
NREL	:	National Renewable Energy Laboratory (USA)
NOAK	:	N^{th}-of-a-kind
OPEX	:	Operating Expenditure
O&M	:	Operations and Maintenance
PM	:	Particulate Matter
PO	:	Pyrolysis Oils
psi	:	Pressure per square inch
PTL	:	Power To Liquid
R&D	:	Research and Development
RD&D	:	Research, Development and Demonstration

RDD&D	:	Research, Development, Demonstration and Deployment
RED	:	Renewable Energy Directive
RES	:	Renewable Energy Sources
RFS2	:	2nd Renewable Fuel Standard program (USA)
SGAB	:	Sub Group of Advanced Biofuels
SIP	:	Synthetic Iso-Paraffins
SNG	:	Substitute natural gas
SPD	:	Synthetic Paraffinic Diesel
SPK	:	Synthetic Paraffinic Kerosene
SPK/A	:	Synthetic Paraffinic Kerosene Aromatics
SSF	:	Simultaneous Saccharification and Fermentation
SSCF		Simultaneous Saccharification and CoFermentation
STF	:	Sustainable Transport Forum
tce	:	Tone of Carbon Equivalent
toe	:	Ton of Oil Equivalent
tkm	:	Ton kilometers, transport of one tone over a distance of one kilometer
TRL	:	Technology Readiness Level
TTW	:	Tank-to-Wheels
UCO	:	Used cooking oil
UN	:	United Nations
USA	:	United States of America
VGO	:	Vacuum Gas Oil
WACC	:	Weighted Average Cost of Capital
WTT	:	Well-to-Tank
WTW	:	Well-to-Wheels
ZEV	:	Zero Emission Vehicle

TERMINOLOGY

Terminology identified in alphabetical order:

Advanced biofuel

Advanced biofuels, such as those made from wastes and algae, provide high greenhouse gas emission savings with a low risk of causing indirect land-use change, and do not compete directly for agricultural land for the food and feed markets

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, pp L239/2 Recital point (7), 15.09.2015.

Alternative Fuels

Alternative fuels mean fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector. They include, inter alia: — electricity, — hydrogen, — biofuels as defined in point (i) of Article 2 of Directive 2009/28/EC, — synthetic and paraffinic fuels, — natural gas, including biomethane, in gaseous form (compressed natural gas (CNG)) and liquefied form (liquefied natural gas (LNG)), and — liquefied petroleum gas (LPG);

Source: EU Directive 2014/94/EC of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure, OJ L307/10, Article 2 (1), 28.10.2014.

Aviation Fuel

Aviation Gasoline or Aviation Turbine Fuels.

Source: US Department of Defense, Standard Practice, MIL-STD-1518E, "Storage, Handling, and Servicing of Aviation Fuels, Lubricating Oils, and Hydraulic Fluids at Contractor Facilities", §3.5, 17 Janurary 2014.

Aviation Turbine Fuel

Aviation Turbine Fuel means fuel for use in Aviation Turbine Engine. Two types of aviation turbine fuels are provided, as follows:

a. Jet A and Jet A-1—Relatively high flash point distillates of the kerosene type.
b. Jet A and Jet A-1 represent two grades of kerosene fuel that differ in freezing point.

Requirements for Jet B fuel now appear in Specification D6615

Source: ASTM D1655-15d, "Standard Specification for Aviation Turbine Fuels", §5

Biodiesel (Fatty Acid Methyl Ester - FAME)

A methyl-ester produced from vegetable or animal oil, of diesel quality, to be used as biofuel.

Source: EU 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 L140/49, Annex III, 05.06.2009.

Bioethanol

Ethanol produced from biomass.

Source: EU 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 L140/49, Annex III, 05.06.2009.

Biofuel

Biofuel means liquid or gaseous fuel for transport produced from biomass.

Source: a. EU 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 L140/27, Article 2i, 05.06.2009.

b. EU Directive 2009/119/EC of the European Parliament and of the Council of 14 September 2009 imposing an obligation on Member States to maintain minimum stocks of crude oil and/or petroleum products, OJ L265/12, Article 2c, 09.10.2009.

Biogas

Gas, comprising principally methane and carbon dioxide, obtained from the anaerobic digestion of biomass

Source: European Standard FprEN 16723-2:2015, "Natural gas and biomethane for use in transport and biomethane for injection in the natural gas network — Part 2: Automotive fuel specifications", §3.1, Brussels 2015.

Bioliquid

Liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass. Includes viscous liquids such as waste cooking oil, animal fats, palm oil, crude tall oil and tall oil pitch.

Source: EU 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, L140/27, Article 2(h), 05.06.2009.

AND

European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.11, Brussels 2012.

Biomethane

Gas comprising principally methane, obtained from either upgrading of biogas or methanation of biosyngas.

Source: European Standard FprEN 16723-2:2015, "Natural gas and biomethane for use in transport and biomethane for injection in the natural gas network — Part 2: Automotive fuel specifications", §3.3, Brussels 2015.

Bio-syngas

Gas, comprising principally carbon monoxide and hydrogen, obtained from gasification of biomass

Source: European Standard FprEN 16723-2:2015, "Natural gas and biomethane for use in transport and biomethane for injection in the natural gas network — Part 2: Automotive fuel specifications", §3.4, Brussels 2015.

Fischer-Tropsch (FT) Process

A catalyzed chemical process in which carbon monoxide and hydrogen are converted into liquid hydrocarbons of various forms. Typical catalysts used are based on iron and cobalt.

Source: US Department of Defense, MIL-DTL-83133J, Detail Specification Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37), §6.4.5. 16 December 2015.

Fischer-Tropsch hydroprocessed Synthetic Paraffinic Diesel (FT-SPD)

SPD synthesized by FT processing. FT-SPD may also be referred to as Paraffinic Middle Distillate (PMD).

Source: US Department of Defense, MIL-DTL 16884N, §6.3.5 Detail Specification. Fuel, Naval Distillate. 22 April 2014.

Fuel

Energy carrier intended for energy conversion.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.36, Brussels 2012.

Hydroprocessed Esters and Fatty Acids (HEFA) SPKs

Synthetic Paraffinic Kerosene produced by hydroprocessing plant, algal oils or animal fats.

Source: US Department of Defense, MIL-DTL-83133J, Detail Specification Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37), §6.4.6. 16 December 2015.

Hydrotreated vegetable oil (HVO)

Vegetable oil thermochemically treated with hydrogen.

Source: 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 L140/49, Annex III, 05.06.2009.

Low-Carbon Fuel

Low carbon transport fuels are essentially liquid or gaseous fuels with a significantly better CO_2 performance (defined by this group as at least 50%) than conventional fossil transport fuels. Low carbon fuels can be based on biomass or other short-cycled carbon resources. Compared with fossil fuels, their life cycles of production and use lead to (much) lower CO2 emissions. So-called (liquid) biofuels are the main group of low carbon fuels.

Source: World Business Council for Sustainable Development (WBCSD), Low Carbon Technology Partnerships initiative (LCTPi): "Low Carbon Transport Fuels", Maison de la Paix, Chemin Eugène-Rigot 2,Case postale 246, 1211 Geneve 21, ISBN: 978-2-940521-44-9, November 2015.

Marine Fuel

"Marine Fuel" means any petroleum-derived liquid fuel intended for use or in use on board a vessel, including those fuels defined in ISO 8217. It includes any petroleum-derived liquid fuel in use on board inland waterway vessels or recreational craft, as defined respectively in Article 2 of Directive 97/68/EC of the European Parliament and of the Council (2) and Article 1(3) of Directive 94/25/EC of the European Parliament and of the Council (3), when such vessels are at sea;

CELEX_32016L0802_EN_TXT.pdf

Source: Directive (EU) 2016/802 of The European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels. OJ L132/63, Article 2c, 21.05.2016.

Paraffinic Diesel Fuel from Synthesis or Hydrotreatment

Paraffinic diesel fuel originates from synthesis or hydrotreatment processes.

Source: European Standard, Final Draft prEN 15940:2016: "Automotive fuels - Paraffinic diesel fuel from synthesis or hydrotreatment - Requirements and test methods". §1, Brussels 2016.

Renewable liquid and gaseous transport fuels of non-biological origin

Liquid or gaseous fuels other than biofuels whose energy content comes from renewable energy sources other than biomass, and which are used in transport.

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, pp L239/7 Article 1§1.10, 15.09.2015.

Synthesized Hydrocarbons

Hydrocarbons derived from alternative sources such as coal, natural gas, biomass, and hydrogenated fats and oils by processes such as gasification, Fischer-Tropsch synthesis, and hydroprocessing.

Source: ASTM D7566-15c, §4.2.5, Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons, ASTM International, West Conshohocken, PA, 2015, DOI: 10.1520/D7566-15C.

Synthesized Iso-Paraffins (SIP)

Synthetic blending component that is comprised essentially of iso-paraffins.

Source: ASTM D7566-15c, §4.2.7, Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons, ASTM International, West Conshohocken, PA, 2015, DOI: 10.1520/D7566-15C.

Synthesized Paraffinic Diesel (SPD)

Middle distillate blending component consisting of n-paraffins, iso-paraffins, and cycloparaffins Hydrocarbons shall be derived from alternative sources such as coal, natural gas, biomass, and hydrogenated fats and oils by processes such as FT synthesis and hydroprocessing.

Source: US Department of Defense, MIL-DTL 16884N, §6.3.9 Detail Specification. Fuel, Naval Distillate. 22 April 2014

Synthesized Paraffinic Kerosene (SPK)

Synthetic blending component that is comprised essentially of isoparaffins, normal paraffins, and cycloparaffins.

Source: ASTM D7566-15c, §4.2.8, Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons, ASTM International, West Conshohocken, PA, 2015, DOI: 10.1520/D7566-15C.

Synthesized Paraffinic Kerosene plus Aromatics (SPK/A)

Synthetic blending component that is comprised of synthesized paraffinic kerosene (SPK) to which synthesized aromatics have been added.

Source: ASTM D7566-15c, §4.2.9, Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons, ASTM International, West Conshohocken, PA, 2015, DOI: 10.1520/D7566-15C.

1st Generation Biofuels

1st Generation Biofuels are:

a. bioethanol produced from crop based sugar or starch via fermentation,
b. biodiesel produced from esterification and transesterification of vegetable oils, fats & waste streams,
c. biomethane produced from upgrading biogas or landfill gas;

Source: DG ENERGY, terminology used in FP7

2nd Generation Biofuels are:

2nd Generation Biofuels are:

a. alcohols produced from lignocellulosic biomass & waste streams via enzymatic hydrolysis and fermentation or via gasification and fermentation,
   b. synthetic biofuels (Fischer-Tropsch, biomethane, dimethylether, alcohols, etc.) produced from lignocellulosic biomass & waste streams via gasification and catalytic synthesis, and,
c. hydrogenated biofuels produced from vegetable oils or used cooking oils, industrial residues & waste streams originating from food crops or process residues

Source: DG ENERGY, terminology used in FP7

3rd Generation Biofuels

3rd generation biofuels are:

a. biofuels produced from non-lignocellulosic biomass such as aquatic biomass,
b. biofuels produced through microbial conversion, direct lignocellulosic sugar and/or alcohol conversion to paraffinic biofuels or oxygenates
c. hydrogenated algal oils or upgraded intermediate oils produced from biomass (such as pyrolysis oils), and,
d. co-processing in petroleum refineries of biomass liquid intermediates (such as pyrolysis oils).

Source: DG ENERGY, terminology used in FP7 and improved by the SGAB

GLOSSARY

A

Accreditation
Third party attestation related to a conformity assessment body conveying formal demonstration to its competence to carry out specific conformity assessment tasks.

Source: European Standard, EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.1, Brussels 2012.

Agricultural residues
Means residues that are directly generated by agriculture; they do not include residues from related industries or processing.

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, pp L239/7 Article 1§1.14, 15.09.2015.

Agrofuels
Biofuels obtained as a product of energy crops and/or agricultural residues

Source: European Standard, EN 14588:2010 "Solid biofuels - Terminology, definitions and descriptions", §4.3, Brussels 2010.

Algae
Algae comprise a large group of photosynthetic, heterotrophic organisms from different phylogenetic groups, representing many taxonomic divisions. They are distributed worldwide, inhabiting predominantly fresh- brackish and seawater ecosystems but even soil, sand and ice.

Source: Adapted from: M.A. Borowitzka and N.R. Moheimani (eds.), Algae for Biofuels and Energy, Developments in Applied Phycology 5, DOI 10.1007/978-94-007-5479-9_2, © Springer Science+Business Media Dordrecht 2013. Chapter 2§1 entitled "Algal Lipids and Their Metabolism" by Irina A. Guschina and John L. Harwood, School of Biosciences, Cardiff University.

Edited by Francisco Gírio Member of the SGAB Group.

Alternative Clean Fuels
Alternative Clean Fuels' means fuels such as electricity, hydrogen, biofuels (liquids), synthetic fuels, methane (natural gas (CNG and LNG) and biomethane) and liquefied petroleum gas (LPG) which serve, at least partly, as a substitute for fossil oil sources in the supply of energy to transport, contribute to its decarbonisation and enhance the environmental performance of the transport sector.

Source: EU Regulation No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU, Article 3 (w), OJ pp.L348/8, 20.12.2013.

Anaerobic digestion
The complex process by which organic matter is decomposed by anaerobic bacteria. The decomposition process produces a gaseous byproduct often called "biogas" primarily composed of methane, carbon dioxide, and hydrogen sulfide.

Source: US Department of Energy, Office of Energy Efficiency and Renewable Energy, Glossary of Energy-Related Terms. http://energy.gov/eere/energybasics/articles/glossary-energy-related-terms#A, accessed 09 February 2016.

Aquaculture

Aquaculture means the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding and protection from predators. Farming also implies individual or corporate ownership of, or rights resulting from contractual arrangements to, the stock being cultivated. For statistical purposes, aquatic organisms which are harvested by an individual or corporate body which has owned them throughout their rearing period contribute to aquaculture, while aquatic organisms which are exploited by the public as a common property resource, with or without appropriate licences, are the harvest of fisheries.

Source: Council Regulation (EC) No 788/96 of 22 April 1996 on the submission by Member States of statistics on aquaculture production, Annex II, OJ L108/5, 01.05.1996.

Aquaculture residues

Means residues that are directly generated by aquaculture; they do not include residues from related industries or processing.

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, Article 1§1.14, OJ pp L239/7, 15.09.2015.

Arable land

Land worked (ploughed or tilled) regularly, generally under a system of crop rotation. Crop rotation is the practice of alternating annual crops grown on a specific field in a planned pattern or sequence in successive crop years so that crops of the same species are not grown without interruption on the same field. Normally the crops are changed annually, but they can also be multiannual. To distinguish arable land from permanent crops or permanent grassland, a threshold of five years is used. This means that if a plot is used for the same crop for five years or more, without in the meantime removing the preceding crop and establishing a new one, it is not considered arable land.

Source: EU Regulation 1200/2009 of 30 November 2009 implementing Regulation (EC) No 1166/2008 of the European Parliament and of the Council on farm structure surveys and the survey on agricultural production methods, as regards livestock unit coefficients and definitions of the characteristics, §2.01, OJ L329/6, 15.12.2009.

B

Bio-based

Bio-based products are wholly or partly derived from materials of biological origin, excluding materials embedded in geological formations and/or fossilised. In industrial processes, enzymes are used in the production of chemical building blocks, detergents, pulp and paper, textiles, etc. By using fermentation and bio-catalysis instead of traditional chemical synthesis, higher process efficiency can be obtained, resulting in a decrease in energy and water consumption, and a reduction of toxic waste.

Source: European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, http://ec.europa.eu/growth/sectors/biotechnology/bio-based-products/index_en.htm, accessed 09 February 2016.

Bio-based content / Biomass content

The term "biobased" means "derived from biomass". Bio-based products (bottles, insulation materials, wood and wood products, paper, solvents, chemical intermediates, composite materials, et cetera.) are products which are wholly or partly derived from biomass. It is essential to characterize the amount of biomass contained in the product by for instance its bio-based content or bio-based carbon content.
Source: European Standard CEN/TR 16721:2014 "Bio-based products - Overview of methods to determine the biobased content", Introduction §3, Brussels 2014.

Biobutanol

Butanol produced from biomass, to be used as biofuel.

Source: 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, Annex III, OJ L140/49, 05.06.2009.

Biodegradation

Primary biodegradation

Structural change (transformation) of a chemical compound by microorganisms resulting in the loss of a specific property

Source: European Standard EN ISO 14593:2005 "Water quality - Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium - Method by analysis of inorganic carbon in sealed vessels (CO2 headspace test) (ISO 14593:1999)", §3.2, Brussels 2005.

Ultimate aerobic biodegradation

Breakdown of a chemical compound or organic matter by microorganisms in the presence of oxygen to carbon dioxide, water and mineral salts of any other elements present (mineralization) and the production of new biomass

Source: European Standard EN ISO 14593:2005 "Water quality - Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium - Method by analysis of inorganic carbon in sealed vessels (CO2 headspace test) (ISO 14593:1999)", §3.1, Brussels 2005.

Bio-DME

Dimethylether produced from biomass, to be used as biofuel.

Source: 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, Annex III, OJ L140/49, 05.06.2009.

Bioeconomy

The production of biomass and the conversion of biomass into value added products, such as food, feed, bio-based products and bioenergy. It includes the sectors of agriculture, forestry,

fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries.

Source: European Commission, COM (2012) 60 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, §1.1, Brussels 13.02.2012.

Bioenergy
Energy from biomass.

Source: European Standard EN 14588:2010 "Solid biofuels - Terminology, definitions and descriptions", §4.18, Brussels 2010.

Bio-ethanol
Ethanol produced from biomass.

Source: EU 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, Annex III, OJ L 140/49, 05.06.2009.

Bio-ETBE
Ethyl-tertio-butyl-ether produced on the basis of bioethanol.

Source: EU 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, Annex III, L 140/49, 05.06.2009.

Biomethanol
Methanol produced from biomass, to be used as biofuel.

Source: EU 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, Annex III, OJ L 140/49, 05.06.2009.

Bio-MTBE
Methyl-tertio-butyl-ether produced on the basis of bio-methanol.

Source: EU 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, Annex III, OJ L140/49, 05.06.2009.

Biofuel pellet
Biofuel pellet is a densified biofuel made from pulverised biomass with or without additives usually with a cylindrical form, random length typically 3,15 mm to 40 mm, and broken ends. The raw material for biofuel pellets can be woody biomass, herbaceous biomass, fruit biomass, or biomass blends and mixtures. They are usually manufactured in a die. The total moisture of biofuel pellets is usually less than 10 % of mass as received.

Source: European Standard, *EN 14588:2010 "Solid biofuels - Terminology, definitions and descriptions", §4.23, European Committee for Standardization (CEN), Brussels 2010.*

Biofuel Production
Transformation of Biomass or of an intermediate product derived from biomass into a fuel.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.9, Brussels 2012.

Biofuel Producer
Organization or unit responsible for the production of the biofuel.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.10, Brussels 2012.

BioHydrogen
'Biohydrogen': hydrogen produced from biomass, and/or from the biodegradable fraction of waste, to be used as biofuel;

Source: EU Directive 2003/30/EC of The European Parliament and of The Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport. L 123/44, Article 2, §2i. 2003.

Bioliquid production
Transformation of Biomass or of an intermediate product derived from biomass into a bioliquid

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.12, Brussels 2012.

Biomass
'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 industrial and municipal waste.

Source: a. EU 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, Article 2e, OJ L140/27, 05.06.2009.

b. EU Directive 2009/119/EC of 14 September 2009 imposing an obligation on Member States to maintain minimum stocks of crude oil and/or petroleum products, Article 2c, OJ L265/12, 09.10.2009.

Biorefinery
Projects under this area use industrial biotechnology to convert a range of different biomass sources into bulk bio-based products (e.g. biochemical and biopolymers).

Source: European Commission, Commission Staff Working Document Impact Assessment Accompanying the document Proposal for a COUNCIL REGULATION on the Bio-Based Industries Joint Undertaking, SWD (2013) 247 final, §2.7.2 pp.21. Brussels, 10.07.2013.

Bio-waste
Bio-waste means biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from food processing plants.

Source: EU Directive 2008/98, of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, Article 3§1, OJ L312/9, 22.11.2008.

Black liquor
Liquor obtained from wood during the process of pulp production, in which the energy content is mainly originating from the content of lignin removed from the wood in the pulping process.

Source: European Standard, *EN 14588:2010 "Solid biofuels - Terminology, definitions and descriptions", §4.28, European Committee for Standardization (CEN), Brussels 2010.*

By-product
A substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste but as being a by-product only if the following conditions are met:
(a) further use of the substance or object is certain;
(b) the substance or object can be used directly without any further processing other than normal industrial practice;
(c) the substance or object is produced as an integral part of a production process; and
(d) further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

Source: EU Directive 2008/98, of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, Article 5, OJ L312/11, 22.11.2008.

Bio-TAEE
Tertiary-amyl-ethyl-ether produced on the basis of bioethanol.

Source: 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, Annex III, OJ. L140/49, 05.06.2009.

C

Carbon footprint
The full quantity of greenhouse gases that can be attributed to an individual, a plant, a company, a product or a whole economy.

Source: International Energy Agency, http://www.iea.org/aboutus/glossary/c/#tabs-2, accessed 09 February 2016.

Cellulose
Cellulose is a linear unbranched polysaccharide having a Degree of Polymerization (DP) of 1,000 –15,000 according to the biological origin. The molecular single block, also called a 'monomer', is β-D-glucose.

Source: Wüstenberg T: *"Cellulose and Cellulose Derivatives in the Food Industry Fundamentals and Applications", Chapter 3 "Cellulose", pp. 96, §3.2.2. 2015 Wiley-VCH Verlag GmbH & Co. KGaA, Boschstr. 12, 69469 Weinheim, Germany. Print ISBN: 978-3-527-33758-3, ePDF ISBN: 978-3-527-68295-9.*

Chain of Custody

System by which a connection is made between information or claims concerning raw materials or intermediate products and claims concerning final products, including all the stages from the raw material production up until the release of the final product for consumption.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.16, Brussels 2012.

Cogeneration

"Cogeneration" means the simultaneous generation in one process of thermal energy and electrical and/or mechanical energy.

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (30), OJ L315/11, 14.11.2012.

NOTE: Synonymous term Combined Heat and Power (CHP)
Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.17, Brussels 2012.

CO_2 equivalent (CO_2-eq)

A metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

Source: Eurostat Statistical books. Energy, transport and environment indicators, 2015 edition. Annex C, pp. 210. ISBN 978-92-79-49471-0. European Union, 2015.

Consignment

Quantity of unfinished or finished product, consisting of one or more batches of the same sustainability characteristics, which is transferred from one economic operator to another one at the same time.
NOTE: Transfer to/from two economic operators involves two consignments.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.20, Brussels 2012.

Continuously forested area

Land spanning more than one hectare with trees higher than five meters and a canopy cover of more than 30%, or trees able to reach those thresholds in situ.

Excludes land that is predominantly under agricultural or urban land use. Land under agricultural use in this context refers to tree stands in agricultural production systems, such as fruit tree plantations, short rotation coppice and, agroforestry systems when crops are grown under tree cover. Includes managed forests with harvests and regrowth at intervals.

Source: a. EU 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, Article 17§4b, OJ L140/37, 05.06.2009.

b. European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.21, Brussels 2012.

Conversion

Chemical, biological or physical process whereby biomass or an intermediate product is converted into a finished biofuel/bioliquid or into an intermediate product.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.22, Brussels 2012.

Co-processing

Simultaneous conversion of feedstocks of different origins e.g. biomass and fossil feedstocks.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.23, Brussels 2012.

Co-product

Substance or object resulting from a production process not being a product, residue or waste.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.24, Brussels 2012.

Cradle to gate

A partial product supply chain, from the extraction of raw materials (cradle) up to the manufacturer's "gate". The distribution, storage, use stage and end-of-life stages of the supply chain are omitted.

Source: Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, (2013/179/EU), Annex II §11, OJ L124/58, 04.05.2013.

Cradle to grave

A product's life cycle that includes raw material extraction, processing, distribution, storage, use, and disposal or recycling stages. All relevant inputs and outputs are considered for all of the stages of the life cycle.

Source: Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, (2013/179/EU), Annex II §11, OJ L124/58, 04.05.2013.

Cyanobacteria

Cyanobacteria are eubacterial, oxygenic phototrophs found in almost every conceivable habitat on earth, and have distinct morphologies including unicellular, colonial, and fi lamentous forms. Similar to some eukaryotic algae, many species have fermentative metabolisms that are activated during anoxia/hypoxia. All cyanobacteria carry out oxygenic

photosynthesis, but some species are also able to perform anoxygenic photosynthesis using sulfide as an electron donor.

Source: M.A. Borowitzka and N.R. Moheimani (eds.), Algae for Biofuels and Energy, Developments in Applied Phycology 5, DOI 10.1007/978-94-007-5479-9_2, © Springer Science+Business Media Dordrecht 2013. Chapter 3 "Hydrogenases, Nitrogenases, Anoxia, and H 2 Production in Water-Oxidizing Phototrophs" §14, pp 61.

D

Default Value

Greenhouse gas emission or greenhouse gas emissions savings for some or all of the steps of a specific biofuel production process calculated in accordance with a methodology compliant with applicable regulations.

Source: a. EU 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, Article 2§o, OJ L140/27, 05.06.2009.

b. European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.27, Brussels 2012.

Degradation

Process leading to a significant change in the structure of a product, typically characterized by a change of properties (e.g. integrity, molecular mass or structure, mechanical strength) and/or by fragmentation, affected by environmental conditions, proceeding over a period of time and comprising one or more steps.

Source: European Standard EN 16575:2014 "Bio-based products - Vocabulary", §2.10, Brussels 2014.

Distribution

Set of operations or activities to supply biofuels or bioliquids or their blends from their delivery to the fuel supplier and up to the final customer.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.29, Brussels 2012.

Dewatering

Dewaters the thickened biomass to approximately 15–25% solids and generates a wet paste.

Source: M.A. Borowitzka and N.R. Moheimani (eds.), Algae for Biofuels and Energy, Developments in Applied Phycology 5, DOI 10.1007/978-94-007-5479-9_2, © Springer Science+Business Media Dordrecht 2013. Chapter 10 "Harvesting, Thickening and Dewatering Microalgae Biomass" §1, pp 166.

DME

dimethyl ether, the chemical compound (CH_3OCH_3).

Source: ASTM D7901 – 14b Standard Specification for Dimethyl Ether for Fuel Purposes, 2014.

Downstream
Occurring along a product supply chain after the point of referral.

Source: Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU, Article 3 (w) OJ. L348/8, 20.12.2013.

Draft Technical Regulation
Draft Technical Regulation means the text of a technical specification or other requirement or of a rule on services, including administrative provisions, formulated with the aim of enacting it or of ultimately having it enacted as a technical regulation, the text being at a stage of preparation at which substantial amendments can still be made.

Source: EU Directive 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (codification,. Article 1 (g), OJ L241/4, 17.09.2015.

E

Economic operator
Individual or organization which has ownership or physical control of biomass, intermediate products and products produced thereof, from the origin to the market availability of the biofuel or bioliquid for one or several steps in the (biofuel or bioliquid) chain of custody.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.30, Brussels 2012.

Ecosystem
Dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.31, Brussels 2012.

Energy
Energy means all forms of energy products, combustible fuels, heat, renewable energy, electricity, or any other form of energy, as defined in Article 2(d) of Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (1), OJ L315/10, 14.11.2012.

Energy crops
Crops supplied essentially for the production of the following energy products:

a. Products considered biofuels listed according to Article 2, point 2 of Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport.
b. Electric and thermal energy produced from biomass.

Source: Council Regulation (EC) No 1782/2003 of 29 September 2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers and amending Regulations (EEC) No 2019/93, (EC) No 1452/2001, (EC) No 1453/2001, (EC) No 1454/2001, (EC) 1868/94, (EC) No 1251/1999, (EC) No 1254/1999, (EC) No 1673/2000, (EEC) No 2358/71 and (EC) No 2529/2001, Article 88, OJ L 270, 21.10.2003.

Energy distributor

Energy distributor means a natural or legal person, including a distribution system operator, responsible for transporting energy with a view to its delivery to final customers or to distribution stations that sell energy to final customers;

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (20), OJ L315/11,14.11.2012.

Energy efficiency

Energy efficiency means the ratio of output of performance, service, goods or energy, to input of energy.

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (4), OJ L315/10, 14.11.2012.

Energy efficiency improvement

Energy efficiency improvement means an increase in energy efficiency as a result of technological, behavioural and/or economic changes.

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (6), OJ L315/10, 14.11.2012.

Environmental impact

Any change to the environment, whether adverse or beneficial, that wholly or partially results from an organisation's activities, products or services (EMAS regulation).

Source: Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, (2013/179/EU), Annex II §11, OJ L124/59, 04.05.2013.

Energy savings

Energy savings means an amount of saved energy determined by measuring and/or estimating consumption before and after implementation of an energy efficiency improvement measure, whilst ensuring normalisation for external conditions that affect energy consumption;

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (5), OJ L315/10, 14.11.2012.

European standard

'European standard' means a standard adopted by the European Committee for Standardisation, the European Committee for Electrotechnical Standardisation or the European Telecommunications Standards Institute and made available for public use;

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (12), OJ L315/11, 14.11.2012.

F

Fallow land

All arable land included in the crop rotation system, whether worked or not, but with no intention to produce a harvest for the duration of a crop year. The essential characteristic of fallow land is that it is left to recover, normally for the whole of a crop year. Fallow land may be:

- Bare land bearing no crops at all.
- Land with spontaneous natural growth, which may be used as feed or ploughed in.
- Land sown exclusively for the production of green manure (green fallow).

Source: Regulation (EC) No 1200/2009 of 30 November 2009 implementing Regulation (EC) No 1166/2008 of the European Parliament and of the Council on farm structure surveys and the survey on agricultural production methods, as regards livestock unit coefficients and definitions of the characteristics, §2.01.12, OJ L329/10, 15.12.2009.

Feedstock

A raw material that can be converted to one or more products.

Source: US Department of Energy, Office of Energy Efficiency and Renewable Energy, Glossary of Energy-Related Terms. http://energy.gov/eere/energybasics/articles/glossary-energy-related-terms#F, *accessed 09 February 2016.*

Final energy consumption

Final energy consumption means all energy supplied to industry, transport, households, services and agriculture. It excludes deliveries to the energy transformation sector and the energy industries themselves.

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (3), OJ L315/10, 14.11.2012.

Fisheries and Forestry residues

Means residues that are directly generated by fisheries and forestry; they do not include residues from related industries or processing.

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, Article 1§1.14, L239/7, 15.09.2015.

G

Greenhouse gas (GHG)

Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself, and by clouds.
NOTE GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6).

Source: European Standard, EN ISO 14064-1:2012 "Greenhouse Gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removal", European Committee for Standardization (CEN), Brussels 2012.

Greenhouse Gas emissions per unit of energy

"Greenhouse Gas emissions per unit of energy" means the total mass of CO2 equivalent greenhouse gas emissions associated with the fuel or energy supplied, divided by the total energy content of the fuel or energy supplied (for fuel, expressed as its low heating value).

Source: EU Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC, Article 1§7, OJ L140/93, 05.06.2009.

H

Heavily contaminated land

Heavily contaminated land means land that is unfit for the cultivation of food and feed due to soil contamination.

Source: EU 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, Annex V §9b, OJ L 140/54, 05.06.2009.

Hydroprocessed or Hydrotreated Renewable Diesel (HRD)

SPD produced from mono-, di-, and triglycerides, free fatty acids, and fatty acid esters from plant, algal oils, or animal fats (for example, fatty acid methyl esters) that have been hydroprocessed to remove essentially all oxygen. HRD may also be referred to as hydroprocessed esters and fatty acids synthetic paraffinic diesel (HEFA-SPD) or PMD.

Source: US Department of Defense, MIL-DTL 16884N, §6.3.7 Detail Specification. Fuel, Naval Distillate. 22 April 2014

Hydroprocessed or Hydrotreated Renewable Jet (HRJ)

Terminology used to identify HEFA SPKs.

Source: US Department of Defense, MIL-DTL-83133J, §6.4.7 Detail Specification Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37). 16 December 2015.

Hydroprocessed

Conventional chemical processing in which hydrogen is reacted with organic compounds in the presence of a catalyst to remove impurities such as oxygen, sulfur, nitrogen; to saturate unsaturated hydrocarbons; or to alter the molecular structure of the hydrocarbon molecules.

Source: ASTM D7566-15C §4.2.5, "Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons".

I

Indirect Land Use Changes (ILUC)

Occur when a demand for a certain land use leads to changes, outside the system boundaries, i.e. in other land use types. These indirect effects can be mainly assessed by means of economic modelling of the demand for land or by modelling the relocation of activities on a global scale. The main drawbacks of such models are their reliance on trends, which might not reflect future developments. They are commonly used as the basis for political decisions.

Source: Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organizations (2013/179/EU), §10, OJ L124/59, 4-05-2013,.

International standard

International standard means a standard adopted by the International Standardisation Organisation and made available to the public.

Source: EU Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (13), OJ L315/10, 14.11.2012.

J

K

L

Landfill

Landfill ' means a waste disposal site for the deposit of the waste onto or into land (i.e. underground), including:

a. —internal waste disposal sites (i.e. landfill where a producer of waste is carrying out its own waste disposal at the place of production), and
b. —a permanent site (i.e. more than one year) which is used for temporary storage of waste,

but excluding:

—

a. facilities where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or dispsal elsewhere, and

b. storage of waste prior to recovery or treatment for a period less than three years as a general rule, or
c. storage of waste prior to disposal for a period less than one year.

Source: EU Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste, Article 2g, OJ L182/4, 16.07.1999.

Land Use, Land-Use Change and Forestry (LULUCF)

The land use, land-use change and forestry ('LULUCF') sector in the Union is a net sink that removes from the atmosphere an amount of greenhouse gases that is equivalent to a significant share of total Union emissions of greenhouse gases.

Source: Decision No 529/2013/EU of the European Parliament and of the Council of 21 May 2013 on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities, (1), OJ L 165/80, 18.06.2013.

Life cycle

Consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal.

Source: a. *Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, (2013/179/EU), Annex II §11, OJ L124/60, 04.05.2013.*

b. International Standard, ISO 14040:2006: Environmental management — Life cycle assessment — Principles and framework, §3.1, International Organization for Standardization, Case postale 56 - CH-1211 Geneva 20, Switzerland.

Life-cycle approach

Takes into consideration the spectrum of resource flows and environmental interventions associated with a product from a supply-chain perspective, including all stages from raw material acquisition through processing, distribution, use, and end-of-life processes, and all relevant related environmental impacts (instead of focusing on a single issue).

Source: Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, (2013/179/EU), Annex II §11, OJ L124/60, 04.05.2013.

Life cycle assessment

The compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its life cycle.

Source: a. *Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, (2013/179/EU), Annex II §11, OJ L124/60, 04.05.2013.*

b. International Standard, ISO 14040:2006: Environmental management — Life cycle assessment — Principles and framework, §3.2, International Organization for Standardization, Case postale 56 - CH-1211 Geneva 20, Switzerland.

Life cycle Greenhouse Gas emissions

Life cycle Greenhouse Gas emissions means all net emissions of CO_2, CH_4 and N_2O that can be assigned to the fuel (including any blended components) or energy supplied. This includes all relevant stages from extraction or cultivation, including land-use changes, transport and distribution, processing and combustion, irrespective of where those emissions occur.

Source: EU Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC, Article 1§6, L140/93, 05.06.2009.

Lignin

Lignin is one of the most important bio-resources for the raw material of the synthesis of environmentally compatible polymers. Lignins are derived from renewable resources such as trees, grasses, and agricultural crops. The higher-order structure of lignin, which consists of phenylpropane units, is fundamentally amorphous. Basically, three major structures of lignin, 4-hydroxyphenyl (1), guaiacyl (2), and syringyl (3) structures are conjugated to produce a three-dimensional lignin polymer in the process of radical-based lignin biosynthesis. For the above reason, lignin does not have a regular structure like cellulose, but is a physically and chemically heterogeneous material, although the exact chemical structure is unknown.

Source: Abe A., Dušek K., Kobayashi Sh.: "Biopolymers Lignin, Proteins, Bioactive Nanocomposites". Chapter 1: "Introduction to Lignin", §1.3, pp. 6. Springer-Verlag Berlin Heidelberg 2010. ISBN 978-3-642-13629-0, e-ISBN 978-3-642-13630-6, DOI 10.1007/978-3-642-13630-6.

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.

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, Article 2§1.r, L239/13, 15.09.2015.

Livestock

'livestock': means all animals kept for use or profit

Source: EU Directive, Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC), Article 2 (d), OJ L375/2, 31.12.1991.

Livestock manure

'livestock manure': means waste products excreted by livestock: or a mixture of litter and waste products excreted by livestock, even in processed form.

Source: EU Directive, Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC), Article 2 (g), OJ L375/2, 31.12.1991.

Low-carbon technologies

Technologies that produce low – or zero – greenhouse-gas emissions while operating. In the power sector this includes fossil-fuel plants fitted with carbon capture and storage, nuclear plants and renewable-based generation technologies.

Source: International Energy Agency, http://www.iea.org/aboutus/glossary/l/, accessed 09 February 2016.

Lower heating value (LHV)

It represents the amount of heat released by the complete combustion of a material at atmospheric pressure assuming both the material and all the combustion productsare at 25ºC and all water, either present in the original material or produced by the combustion, remains in the gaseous state. The LHV of the wet stream is the difference between the LHV of its dry matter content and the heat required to dry out the material. The following formula maybe used:

$$LHV = LHV_{dry}(100 - \%W) * 100 - \%W \frac{2{,}442}{100}$$

Where:
LHV_{dry}: is the LHV of the dry matter expressed in MJ/kg.
%W: is the mass percentage of water in the stream.
2,442: is the latent heat of vaporization of water at 25ºC expressed in MJ/kg.

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.51, Brussels 2012.

Low indirect land-use change-risk biofuels

Means biofuels, the feedstocks of which were produced within schemes which reduce the displacement of production for purposes other than for making biofuels and which were produced in accordance with the sustainability criteria for biofuels.

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, Article 1§1.12, OJ L239/7, 15.09.2015.

M

Macroalgae

Macro-algae or "seaweeds" are multicellular plants growing in salt, brackish or fresh water. They are often fast growing and can reach sizes of up to 60m in length. They are classified into three broad groups based on their pigmentation:

i) brown seaweed (Phaeophyceae);
ii) red seaweed (Rhodophyceae) and
iii) green seaweed (Chlorophyceae).

Seaweeds are mainly utilised for the production of food and the extraction of hydrocolloids.

Source: Anders S Carlsson, Jan B van Beilen, Ralf Möller and David Clayton "Outputs from the EPOBIO project", ISBN 13: 978-1-872691-29-9, Editor: Dianna Bowles September 2007, Published by: CPL Press, Tall Gables, The Sydings, Speen, Newbury, Berks RG14 1RZ, UK

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Edited by Fransisco Girio Member of the SGAB Group.

Marginal land

Low quality land the value of whose production barely covers its cultivation costs.

Source: European Environmental Agency, Environmental Terminology and Discovery Service, http://glossary.eea.europa.eu/terminology/concept_html?term=marginal%20land, Accessed 09 February 2016.

Marine Diesel Oil

'Marine Diesel Oil' means any marine fuel as defined for DMB grade in Table I of ISO 8217 with the exception of the reference to the sulphur content;

Source: Directive (EU) 2016/802 of The European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels. OJ L132/63, Article 2d, 21.05.2016.

Marine Gas Oil

"Marine Gas Oil" means any marine fuel as defined for DMX, DMA and DMZ grades in Table I of ISO 8217 with the exception of the reference to the sulphur content;

Source: Directive (EU) 2016/802 of The European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels. OJ L132/63, Article 2e, 21.05.2016.

Mass balance

Relationship between input and output of a specific substance within a system in which the output from the system cannot exceed the input into the system. (CEN/TC 411, 2014)

Source: European Standard EN 16214-1:2012 "Sustainability criteria for the production of biofuels and bioliquids for energy applications – Principles, criteria, indicators and verifiers – Part 1: Terminology", §2.52, Brussels 2012.

Microalgae

Microalgae are microscopic organisms that grow in salt, fresh, brackish water or even in waste water. They are microorganisms either prokaryotic or eukaryotic usually with a fast growth. They can also be photoautotrophic, heterotrophic or mixotrophic in terms of nutrition modes. The three most important classes of micro-algae in terms of abundance and distribution area are:

i) the diatoms (Bacillariophyceae),
ii) the green algae (Chlorophyceae), and
iii) the golden algae (Chrysophyceae).

The cyanobacteria (blue-green algae) (Cyanophyceae) are also referred to as micro-algae, this applies for example to Spirulina (Arthrospira platensis and A. maxima).

Source: Adapted from: Anders S Carlsson, Jan B van Beilen, Ralf Möller and David Clayton "Outputs from the EPOBIO project", ISBN 13: 978-1-872691-29-9, Editor: Dianna Bowles September 2007, Published by: CPL Press, Tall Gables, The Sydings, Speen, Newbury, Berks RG14 1RZ, UK. AND

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Micro-Organism

'micro-organism' means any microbiological entity, cellular or non-cellular, capable of replication or of transferring genetic material, including lower fungi, viruses, bacteria, yeasts, moulds, algae, protozoa and microscopic parasitic helminths.

Source: Regulation (EU) No 528/2012 of The European Parliament and of The Council of 22 May 2012 concerning the making available on the market and use of biocidal products. Article 3 §1b, OJ L167/10, 27.6.2012.

N

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 and cover crops before and after main crops), industrial residues (including from food and feed crops after vegetal oils, sugars, starches and protein have been extracted), and material from biowaste.

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, Article 2§1.s, OJ L239/13, 15.09.2015.

O

Open ponds

Open pond systems are shallow ponds in which algae are cultivated. Nutrients can be provided through runoff water from nearby land areas or by channelling the water from sewage/water treatment plants. The water is typically kept in motion by paddle wheels or rotating structures, and some mixing can be accomplished by appropriately designed guides. Algal cultures can be defined (one or more selected strains), or are made up of an undefined mixture of strains.

Source: Anders S Carlsson, Jan B van Beilen, Ralf Möller and David Clayton "Outputs from the EPOBIO project", ISBN 13: 978-1-872691-29-9, Editor: Dianna Bowles September 2007, Published by: CPL Press, Tall Gables, The Sydings, Speen, Newbury, Berks RG14 1RZ, UK

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Other Requirements

Other Requirements means a requirement, other than a technical specification, imposed on a product for the purpose of protecting, in particular, consumers or the environment, and which affects its life cycle after it has been placed on the market, such as conditions of use, recycling, reuse or disposal, where such conditions can significantly influence the composition or nature of the product or its marketing.

Source: EU Directive 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (codification), Article 1 (d), OJ L241/3, 17.09.2015.

P

Photoautotrophic Algae

Photoautotrophic algae have the capacity to convert the energy from the light and CO_2 into chemical energy in the form of organic compounds through the photosynthesis. Light is clearly one of the most important factors, affecting biomass productivity. For the production of biofuels and bioenergy using microalgae the organic compounds of interest are lipids, (for biodiesel), sugars (for bioethanol/biohydrogen) and/or organic biomass. The effective use of the available light (i.e. sunlight in most cases) in order to achieve the maximum photosynthetic efficiency is the fundamental and essential criterion for the sustainable and economic production of biofuels from algae. Nevertheless, there is an absolute limit to photosynthetic efficiency.

Source: Adapted from: M.A. Borowitzka and N.R. Moheimani (eds.), Algae for Biofuels and Energy, Developments in Applied Phycology 5, DOI 10.1007/978-94-007-5479-9_2, © Springer Science+Business Media Dordrecht 2013. Chapter 8§7.2 entitled "Open Pond Culture Systems" by Michael A. Borowitzka and Navid Reza Moheimani, Algae R&D Centre, School of Biological Sciences & Biotechnology, Murdoch University, Australia.

Edited by Fransisco Girio. Member of the SGAB Group.

Photobioreactors

Photobioreactors are different types of tanks or closed systems in which algae are cultivated either photoautotrophically or mixotrophically under natural or artificial light. Algal cultures consist of a single or several specific strains optimized for producing the desired product. Water, necessary nutrients and CO2 are provided in a controlled way, while oxygen has to be removed (on the closed reactors). Algae should receive sunlight either directly through the transparent container walls or via light fibres or tubes that channel it from sunlight collectors or by artificial illumination (e.g. fluorescent lamps or LEDs).

Source: Adapted from: Anders S Carlsson, Jan B van Beilen, Ralf Möller and David Clayton "Outputs from the EPOBIO project", ISBN 13: 978-1-872691-29-9, Editor: Dianna Bowles September 2007, Published by: CPL Press, Tall Gables, The Sydings, Speen, Newbury, Berks RG14 1RZ, UK
and
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Edited by Fransisco Girio. Member of the SGAB Group.

Photosynthesis
Photosynthesis is a key process of converting carbon dioxide (atmospheric or from flue gases) into numerous metabolites, using photons as a source of energy, and it is pivotal for many metabolic pathways involved in the production of new biomass.

Source: Adapted from: M.A. Borowitzka and N.R. Moheimani (eds.), Algae for Biofuels and Energy, Developments in Applied Phycology 5, DOI 10.1007/978-94-007-5479-9_2, © Springer Science+Business Media Dordrecht 2013. Chapter 2§2.1.3.1 entitled "Algal Lipids and Their Metabolism" by Irina A. Guschina and John L. Harwood, School of Biosciences , Cardiff University.

Edited by Fransisco Girio. Member of the SGAB Group.

Policy measure
Policy measure means a regulatory, financial, fiscal, voluntary or information provision instrument formally established and implemented in a Member State to create a supportive framework, requirement or incentive for market actors to provide and purchase energy services and to undertake other energy efficiency improvement measures;

Source: Directive 2012/27/EC of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (18)

Primary energy consumption
Primary energy consumption means gross inland consumption, excluding non-energy uses.

Source: Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 2 (2).

Pure vegetable oil
Oil produced from oil plants through pressing, extraction or comparable procedures, crude or refined but chemically unmodified, when compatible with the type of engines involved and the corresponding emission requirements.

Source: 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, L 140/49. Annex III.

Pyrolysis
Chemical decomposition of organic materials by heating in the absence of oxygen.

Source: ASTM D7544-12: "Standard Specification for Pyrolysis Liquid Biofuel", §3.1.8

Pyrolysis Liquid Biofuel
Liquid product from the Pyrolysis of biomass.

Source: ASTM D7544-12: "Standard Specification for Pyrolysis Liquid Biofuel", §3.1.9

Processing Residue
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.

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, pp L239/7 Article 1§1.13.

R

Raceway ponds

Raceway ponds are the most widely used culture system for the commercial production of microalgae, as well as in the treatments of wastewaters. This is mainly because they generally are the cheapest to construct and operate. The culture in the ponds must be circulated at about 20–30 $cm*s^{-1}$ to keep the algae suspended as well as to provide relatively even illumination to the algae and prevent thermal strati fi cation. Many systems have been trialed for circulating and mixing the algae culture in a raceway pond. These include:

- Air lifts
- Archimedes screws
- Propellers
- Pumps (impellers)
- Water jets
- Paddlewheels

Source: M.A. Borowitzka and N.R. Moheimani (eds.), Algae for Biofuels and Energy, Developments in Applied Phycology 5, DOI 10.1007/978-94-007-5479-9_2, © Springer Science+Business Media Dordrecht 2013. Chapter 8 "Opened pond cultural systems" §6, 6.1, pp 135, 136.

Renewable energy sources

Means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.

Source: EU 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 140/27, Article 2 (a), 05-06-2009.

Renewable material

Material that is composed of biomass and that can be continually replenished.

Source: European Standard, EN 16575:2014 "Bio-based products - Vocabulary", §2.15, European Committee for Standardization (CEN), Brussels 2014.

Resource depletion

Impact category that addresses use of natural resources, either renewable or non-renewable, biotic or abiotic.

Source: Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, (2013/179/EU), OJ L124/61, 04-05-2013, Annex II §11.

Roundwood production

Roundwood production (the term is also used as a synonym for removals in the context of forestry) comprises all quantities of wood removed from the forest and other wooded land, or other tree felling site during a defined period of time.

Source: European Union, Eurostat, http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Roundwood_production, accessed 09 February 2016, ISSN 2443-8219.

S

Sequestration

Sequestration is the process of increasing the carbon content of a carbon pool other than the atmosphere.

Source: European Commission, Joint Research Centre – IET, "Carbon accounting of forest bioenergy: Conclusions and recommendations from a critical literature review", pp. 9, by Agostini, A., Giuntoli, J., Boulamanti, A., Marelli, L., 2014, ISBN 978-92-79-25100-9, doi:10.2788/29442, Luxembourg. Publications Office of the European Union, 2014.

Set-aside Land

Set aside areas are areas which are pursuant to Articles 22 to 24 of Regulation (EC) No 1257/1999, which are neither put to any agricultural use nor used for any lucrative purposes other than those accepted for other land set aside under the Regulation (EC) No 1782/2003.

Source: Council Regulation (EC) No 1782/2003 of 29 September 2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers and amending Regulations (EEC) No 2019/93, (EC) No 1452/2001, (EC) No 1453/2001, (EC) No 1454/2001, (EC) 1868/94, (EC) No 1251/1999, (EC) No 1254/1999, (EC) No 1673/2000, (EEC) No 2358/71 and (EC) No 2529/2001. OJ Article 54 - 56, 21.10.2003,

Severely degraded land

'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.

Source: EU 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 140/54, Annex V §9a, 05-06-2009.

Short Rotation Coppice(SRC)

Wooded areas managed for growing wooded plants, where the rotation period is 20 years or less. The rotation period is the time between the first sowing/planting of the trees and the harvest of the final product, where harvesting does not include normal management actions like thinning.

Source: Regulation (EC) No 1200/2009 of 30 November 2009 implementing Regulation (EC) No 1166/2008 of the European Parliament and of the Council on farm structure surveys and the survey on agricultural production methods, as regards livestock unit coefficients and definitions of the characteristics, OJ L329/12, §2.05.02.01.

Sink
The rate of build-up of CO2 in the atmosphere can be reduced by taking advantage of the fact that carbon can accumulate in vegetation and soils in terrestrial ecosystems. Any process, activity or mechanism which removes a greenhouse gas from the atmosphere is referred to as a "sink".

Source: European Commission, Joint Research Centre – IET, "Carbon accounting of forest bioenergy: Conclusions and recommendations from a critical literature review", pp. 9, by Agostini, A., Giuntoli, J., Boulamanti, A., Marelli, L., 2014, ISBN 978-92-79-25100-9, doi:10.2788/29442, Luxembourg. Publications Office of the European Union, 2014.

Soil Carbon
Organic carbon in mineral and organic soils (including peat) to a specified depth.

Source: European Commission, Joint Research Centre – IET, "Carbon accounting of forest bioenergy: Conclusions and recommendations from a critical literature review", pp. 10, by Agostini, A., Giuntoli, J., Boulamanti, A., Marelli, L., 2014, ISBN 978-92-79-25100-9, doi:10.2788/29442, Luxembourg. Publications Office of the European Union, 2014.

Soil Organic Matter (SOM)
Is the measure of the content of organic material in soil. This derives from plants and animals and comprises all of the organic matter in the soil exclusive of the matter that has not decayed.

Source: Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, (2013/179/EU), OJ L124/61, 04-05-2013, Annex II §11.

Stemwood
Part of tree stem with the branches removed

Source: European Committee for Standardization (CEN), EN 14588:2010 "Solid biofuels - Terminology, definitions and descriptions", §4.153, Brussels 2010.

Supply chain
Supply chain means a linked set of resources and processes that begins with the production of raw material and extends through the manufacturing, processing, handling and delivery of products to the purchaser. The supply chain may include vendors, manufacturing facilities, logistics providers, internal distribution centers, distributors, wholesalers and other entities involved in the manufacturing, processing, handling and delivery of the goods and their related services.

Source: European Standard, EN 16214-1:2012, Sustainability Criteria for the production of biofuels and bioliquids for energy application – Principles, Criteria, indicators and Verifiers – Part 1: Terminology. §2.75, European Committee for Standardization (CEN), 2012.

Starch-rich crops
Strach-rich crops meaning 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)

Source: EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels

and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, pp L239/7 Article 1§1.11.

Sustainability
Sustainability is the goal of sustainable development.

Source: European Standard, prEN 16751:2014, "Bio-based products - Sustainability criteria", §3.30, European Committee for Standardization (CEN), Brussels 2014.

Sustainability criteria
States or properties as a means of judging whether or not a sustainability principle has been fulfilled

Source: European Standard, EN 16214-1:2012, Sustainability Criteria for the production of biofuels and bioliquids for energy application – Principles, Criteria, indicators and Verifiers – Part 1: Terminology. §2.77, European Committee for Standardization (CEN), 2012.

Sustainable development
Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is about integrating the goals of a high quality of life, health and prosperity with social justice and maintaining the earth's capacity to support life in all its diversity. These social, economic and environmental goals are interdependent and mutually reinforcing. Sustainable development can be treated as a way of expressing the broader expectations of society as a whole.

Source: European Standard, EN 16575:2014 "Bio-based products - Vocabulary", §2.16, European Committee for Standardization (CEN), Brussels 2014.

Sustainable fuel (partially renewable)

A biofuel which meets the required sustainability criteria whose energy content comes partially from renewable energy sources.

Source: Brian Denvir, Richard Taylor, Ausilio Bauen, Gemma Toop, Sacha Alberici, "Novel Low Carbon Transport Fuels and the RTFO: sustainability implications", Scoping paper for the UK Department for Transport, §2.2, pp. 6, 16-03-2015.

Sustainable fuel (wholly renewable)
A biofuel which meets the required sustainability criteria[1] whose energy content comes entirely from renewable energy sources.

Source: Brian Denvir, Richard Taylor, Ausilio Bauen, Gemma Toop, Sacha Alberici, "Novel Low Carbon Transport Fuels and the RTFO: sustainability implications", Scoping paper for the UK Department for Transport, §2.2, pp. 6, 16-03-2015.

T

[1] E4Tech an Ecofys in their report referred to the UK RTFO criteria . In our case the sustainability criteria would refer to the criteria in the amended RED 2015/1513.

Technical Specification

Technical specification means a specification contained in a document which lays down the characteristics required of a product such as levels of quality, performance, safety or dimensions, including the requirements applicable to the product as regards the name under which the product is sold, terminology, symbols, testing and test methods, packaging, marking or labelling and conformity assessment procedures. The term 'technical specification' also covers production methods and processes used in respect of agricultural products, as referred to in the second subparagraph of Article 38(1) of the Treaty on the Functioning of the European Union (TFEU), products intended for human and animal consumption, and medicinal products as defined in Article 1 of Directive 2001/83/EC of the European Parliament and of the Council (1), as well as production methods and processes relating to other products, where these have an effect on their characteristics.

Source: EU Directive 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (codification). OJ L241/3, Article 1 (c), 17-09-2015.

Technical regulation

Technical regulation means technical specifications and other requirements or rules on services, including the relevant administrative provisions, the observance of which is compulsory, de jure or de facto, in the case of marketing, provision of a service, establishment of a service operator or use in a Member State or a major part thereof, as well as laws, regulations or administrative provisions of Member States, except those provided for in Article 7, prohibiting the manufacture, importation, marketing or use of a product or prohibiting the provision or use of a service, or establishment as a service provider. De facto technical regulations shall include:

(i) laws, regulations or administrative provisions of a Member State which refer either to technical specifications or to other requirements or to rules on services, or to professional codes or codes of practice which in turn refer to technical specifications or to other requirements or to rules on services, compliance with which confers a presumption of conformity with the obligations imposed by the aforementioned laws, regulations or administrative provisions;

(ii) voluntary agreements to which a public authority is a contracting party and which provide, in the general interest, for compliance with technical specifications or other requirements or rules on services, excluding public procurement tender specifications;

(iii) technical specifications or other requirements or rules on services which are linked to fiscal or financial measures affecting the consumption of products or services by encouraging compliance with such technical specifications or other requirements or rules on services; technical specifications or other requirements or rules on services linked to national social security systems are not included.

Source: EU Directive 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (codification). OJ L241/4, Article 1 (f), 17-09-2015.

Tonne of Oil Equivalent (toe)

The tonne of oil equivalent (toe) is a unit of energy flows.

Source: Regulation (EU) No 549/2013 of the European Parliament and of the Council of 21 May 2013 on the European system of national and regional accounts in the European Union, OJ L174/509, §22.67, 26-06-2013.

The amount of energy released by burning one tonne of crude oil, approximately 42 GJ (as different crude oils have different calorific values, the exact value of the toe is defined by convention). Multiples of the toe are used, in particular the megatoe (Mtoe, one million toe) and the gigatoe (Gtoe, one billion toe).

Source: European Commission, Joint Research Centre, IET,Sustainable Transport Unit, Marelli, L., Padella, M., Edwards, R., Moro, A., Kousoulidou, M., Giuntoli, J., Baxter, D., Vorkapic, V., Agostini, A., O'Connell, A., Lonza, L., "The impact of Biofuels on transport and environment, and their connection to the agricultural development in Europe". European Parliament Directorate – General for Internal Policies, Policy department B: Structural and Cohesion Policies. European Union 2015.

Total Carbon

Total Carbon (TC) is the quantity of carbon present in a product in the form of organic, inorganic and elemental carbon.

Source: European Standard, EN 16575:2014 "Bio-based products - Vocabulary", §2.17, European Committee for Standardization (CEN), Brussels 2014.

Total Organic Carbon

Total Organic Carbon (TOC) means the quantity of organic carbon present in a product. Total organic carbon is often determined as the carbon that is converted into carbon dioxide by combustion and which is not liberated as carbon dioxide by acid treatment.

Source: European Standard, EN 16575:2014 "Bio-based products - Vocabulary", §2.18, European Committee for Standardization (CEN), Brussels 2014.

Transesterification

Transesterification is the reaction of a vegetable oil or animal fat with an alcohol, such as methanol or ethanol, in the presence of a catalyst to yield mono-alkyl esters and glycerin.

Source: ASTM D6751-15ce1, "Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels", ASTM International, West Conshohocken, PA, 2015.

U

W

Waste

Any substance, material or object which the holder discards or intends or is required to discard. Substances that have been intentionally modified or contaminated to meet that definition are not covered by this definition.

Source: a. EU Directive 2015/1513, of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, pp L239/13 Article 2§1.p. and

b. EU Directive 2008/98, of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, pp. L312/9 Article 3§1.

Well-to-wheel (WTW)

Methodology aiming at quantifying energy required for and GHG resulting from the production, transport, distribution and combustion of conventional and alternative road transportation fuels. Is commonly divided into Well-To-Tank (WTT) and Tank-To-Wheel (TTW).

Source: European Commission, Joint Research Centre, IET,Sustainable Transport Unit, Marelli, L., Padella, M., Edwards, R., Moro, A., Kousoulidou, M., Giuntoli, J., Baxter, D., Vorkapic, V., Agostini, A., O'Connell, A., Lonza, L., "The impact of Biofuels on transport and environment, and their connection to the agricultural development in Europe". European Parliament Directorate – General for Internal Policies, Policy department B: Structural and Cohesion Policies. European Union 2015.

Wood fuels

All types of biofuels originating directly or indirectly from woody biomass. Synonym to wood based fuels and to wood-derived biofuels

Source: European Committee for Standardization (CEN), EN 14588:2010 "Solid biofuels - Terminology, definitions and descriptions", §4.183, Brussels 2010.

Wood processing industry by-products and residues

Woody biomass residues originating from the wood processing as well as the pulp and paper industry. See also bark, cork residues, cross-cut ends, edgings, fibreboard residues, fibre sluge, grinding dust, particleboard residues, plywood residues, saw dust, slabs, and wood shavings.

Source: European Standard, EN 14588:2010 "Solid biofuels - Terminology, definitions and descriptions", §4.184, European Committee for Standardization (CEN), Brussels 2010.

Woody biomass

Biomass from trees, bushes and shrubs. This definition includes forest and plantation wood, wood processing industry by-products and residues, and used wood.

Source: European Standard, EN 14588:2010 "Solid biofuels - Terminology, definitions and descriptions", §4.186, European Committee for Standardization (CEN), Brussels 2010.

Y

Yield

The harvested production per area under cultivation.

Source: Regulation (EC) No 543/2009 of the European Parliament and of the Council of 18 June 2009 concerning crop statistics and repealing Council Regulations (EEC) No 837/90 and (EEC) No 959/93, Article 2§h. OJ 29-06-2009, L167/3.

CONVERSION FACTORS

Prefixes

exa	(E)	meaning 10^{18}	deci	(d)	meaning 10^{-1}
peta	(P)	meaning 10^{15}	centi	(c)	meaning 10^{-2}
tera,	(T)	meaning 10^{12}	milli	(m)	meaning 10^{-3}
giga	(G)	meaning 10^{9}	micro	(µ)	meaning 10^{-6}
mega	(M)	meaning 10^{6}	nano	(n)	meaning 10^{-9}
kilo	(k)	meaning 10^{3}	pico	(p)	meaning 10^{-12}
hecto	(h)	meaning 10^{2}			
deka	(da)	meaning 10^{1}			

Factors

A factor	=	multiplier	x	B factor
Atmospheres	=	0.0009665	x	gr/cm^2
Atmospheres	=	14.22334	x	Pounds/ in^2
bbl	=	42	x	gallons US
bbl	=	34.9723158	x	gallons UK
bbl	=	159	x	liter
bbl	=	0.158987295	x	m^3
Btu	=	3412	x	kWh
Btu/hr	=	3412	x	kW
MMBtu	=	0.293	x	MWh
calories	=	4.1868	x	Joules
kcalories	=	0.001163	x	kWh
EUR	=	1.12	x	USD
ft·lb	=	1.355818	x	Joules
gal. (USA, liq.)	=	0.00378541178	x	m^3
gal. (USA, liq.)	=	3.785	x	liter
gal (UK, liq.)	=	0.00454609	x	m^3
gal (UK, liq.)	=	4.54609	x	liter
Joules	=	0.000948	x	Btu
Joules	=	0.238845897	x	calories
Joules	=	$2.777777\ 10^{-7}$	x	kWh
EJ	=	278	x	TWh
PJ	=	0.278	x	TWh
kW	=	3414.4259497	x	Btu (th)/hr
kW	=	1.3596216173	x	Mech. hp
MWh	=	3.6	x	MJ/kg
kWh	=	3.41214163	x	kBtu
kWh	=	2,655,223.7375	x	ft·lb
toe	=	41.867982	x	GJ
toe	=	10	x	Gcal
toe	=	39.6832072	x	MBtu
toe	=	0.01163	x	GWh
toe	=	1.42857143	x	tce
ton US gasoline(LHV)	=	12.1	x	MWh

A factor	=	multiplier	x	B factor
USD/bbl gasoline equivalent and day	=	1	**x**	USD/bpd ge
USD/bpd g.e.	=	0.01485	**x**	EUR/kW (base: 32,67 MJ/liter EU petrol)
Watt	=	3,600	**x**	J/h
Watt	=	0.0009484517	**x**	Btu (th)/sec
Watt	=	0.8604206501	**x**	kcal (th)/h
Watt		0.7375621493	**x**	lb * ft/sec

Energy content liquid fuels - biofuels

	Lower Heating Value[2]								
Liquid Fuels	**Btu/gal**	**Btu/lb**	**MJ/kg[3]**	**MJ/liter**	**GJ/liter**	**Density grams/gal US**	**kg/liter**	**liter/kg**	**toe/liter**
Crude oil	129,670	18,352	42.686	36.14072	0.036141	3,205	0.846671	1.181096	1.513139
Conventional gasoline	116,090	18,679	43.448	32.35580	0.032356	2,819	0.744701	1.342821	1.354672
Reformulated or low-sulfur gasoline	113,602	18,211	42.358	31.66222	0.031662	2,830	0.747495	1.337801	1.325633
CA reformulated gasoline	113,927	18,272	42.500	31.75298	0.031753	2,828	0.747130	1.338456	1.329433
U.S. conventional diesel	128,450	18,397	42.791	35.80069	0.035801	3,167	0.836633	1.195267	1.498903
Low-sulfur diesel	129,488	18,320	42.612	36.08995	0.036090	3,206	0.846936	1.180727	1.511013
Petroleum naphtha	116,920	19,320	44.938	32.58713	0.032587	2,745	0.725152	1.379021	1.364357
NG-based FT naphtha	111,520	19,081	44.383	31.08208	0.031082	2,651	0.700320	1.427918	1.301344
Residual oil	140,353	16,968	39.466	39.11808	0.039118	3,752	0.991174	1.008905	1.637795
Methanol	57,250	8,639	20.094	15.95632	0.015956	3,006	0.794101	1.259285	0.668059
Ethanol	76,330	11,587	26.952	21.27417	0.021274	2,988	0.789346	1.266871	0.890706
Butanol	99,837	14,775	34.366	27.82587	0.027826	3,065	0.809687	1.235045	1.165013
Acetone	83,127	12,721	29.589	23.16858	0.023169	2,964	0.783006	1.277129	0.970022
E-Diesel Additives	116,090	18,679	43.448	32.35580	0.032356	2,819	0.744701	1.342821	1.354672
Liquefied petroleum gas (LPG)	84,950	20,038	46.607	23.67667	0.023677	1,923	0.508003	1.968493	0.991295
Liquefied natural gas (LNG)	74,720	20,908	48.632	20.82544	0.020825	1,621	0.428223	2.335232	0.871919

[2] The Lower Heating Value (also known as Net Calorific Value) of a fuel is defined as the amount of heat released by combusting a specified quantity (initially at 25°C) and returning the temperature of the combustion products to 150°C, which assumes the latent heat of vaporization of water in the reaction products is not recovered. The LHV are the useful calorific values in combustion.

[3] The heating values in units of MJ/kg, are converted from the heating values in units of Btu/lb.

	Lower Heating Value[2]								
Liquid Fuels	**Btu/gal**	**Btu/lb**	**MJ/kg[3]**	**MJ/liter**	**GJ/liter**	**Density grams/gal US**	**kg/liter**	**liter/kg**	**toe/liter**
Dimethyl ether (DME)	68,930	12,417	28.882	19.21169	0.019212	2,518	0.665185	1.503341	0.804355
Dimethoxy methane (DMM)	72,200	10,061	23.402	20.12308	0.020123	3,255	0.859880	1.162953	0.842513
Methyl ester (biodiesel, BD)	119,550	16,134	37.528	33.32014	0.033320	3,361	0.887882	1.126275	1.395047
Fischer-Tropsch diesel (FTD)	123,670	18,593	43.247	34.46844	0.034468	3,017	0.797007	1.254694	1.443124
Renewable Diesel I (SuperCetane)	117,059	18,729	43.563	32.62587	0.032626	2,835	0.748928	1.335242	1.365979
Renewable Diesel II (UOP-HDO)	122,887	18,908	43.979	34.25021	0.034250	2,948	0.778779	1.284061	1.433987
Renewable Gasoline	115,983	18,590	43.239	32.32598	0.032326	2,830	0.747607	1.337601	1.353423
Liquid Hydrogen	30,500	51,621	120.07	8.50075	0.008501	268	0.070798	14.124671	0.355909
Methyl tertiary butyl ether (MTBE)	93,540	15,094	35.108	26.07082	0.026071	2,811	0.742588	1.346642	1.091533
Ethyl tertiary butyl ether (ETBE)	96,720	15,613	36.315	26.95713	0.026957	2,810	0.742323	1.347122	1.128640
Tertiary amyl methyl ether (TAME)	100,480	15,646	36.392	28.00509	0.028005	2,913	0.769533	1.299489	1.172516
Butane	94,970	19,466	45.277	26.46938	0.026469	2,213	0.584613	1.710534	1.108219
Isobutane	90,060	19,287	44.862	25.10090	0.025101	2,118	0.559516	1.787258	1.050924
Isobutylene	95,720	19,271	44.824	26.67841	0.026678	2,253	0.595180	1.680165	1.116971
Propane	84,250	19,904	46.296	23.48157	0.023482	1,920	0.507210	1.971569	0.983126

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