



EU POLICIES ON RENEWABLES AND ALTERNATIVE FUELS IN 2023: STATUS AND PERSPECTIVES

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The views expressed here are purely those of the authors and may not, under any circumstances, be regarded as an official position of the European Commission.

IEA Bioenergy Task 39, Leipzig, October 2023

Summary and Disclaimer

- The JRC is the **European Commission's science and knowledge service**.
- Aim at providing **independent, evidence-based knowledge and science, supporting EU policies** to positively impact society.
- The C2 unit is based in Ispra, Northern Italy, and serves the **EU renewable energy** and **energy efficiency policies**.
- We support research communities, standards organisations and public and private stakeholders.
- We work on bio-energies, renewables and alternative fuels, assessing **GHG emissions accounting** and **energy balances**.
- We are also collaborating with International agencies and initiatives.



Source: geoERA groundwater



(JRC, 2020)

European legislative framework

- The **European Green Deal** set the path in 2019 to a green transition, towards climate neutrality by 2050.
- EC released in 2021 the '**fit for 55**' package, updating the EU target for GHG emissions reduction at 55% by 2030
- **REPowerEU** set in 2022 more ambitious RES target and **35 bcm biomethane** by 2030
- The proposed revision of the Renewable Energy Directive 2018/2001 (**RED III**) set a target of 42.5% RES by 2030:
 - for transports **14.5% GHG intensity reduction** (compared to the FFC baseline) or binding 29% RES;
 - sub-target of 5.5% for **advanced biofuels & renewable fuels of non-biological origin** (minimum requirement of 1% **RFNBO**) (with a 2x multiplier);
 - Revised sustainability requirements for bioenergy and biogas (plants capacity), strengthened requirements for biomass supply.
- GHG reduction thresholds as in RED II: **50-65% for biofuels**, depending on date of facility construction, **70% for RFNBOs & RCFs**.

Advanced biofuels in the RED II

What's an advanced biofuels in EU?

- According to the Renewable Energy Directive (RED II, 2018/2001), advanced biofuels are biofuels produced from the **feedstock listed in Part A of Annex IX**.
- The list includes many types of lignocellulosic material, animal manure, sewage sludge, and algae, as well as selected other wastes and residues.
- Moreover, the contribution of biofuels produced from the feedstocks defined in Annex IX, part B, including **used cooking oil and category 1 and 2 animal fats**, is **limited to 1.7%**, with an option for MSs to request higher caps depending on national feedstock availability.
- Multipliers: **2x** for adv. biofuels in road transports, **1.2x** for adv. biofuels and **1.5x** for RFNBOs in **aviation** and **maritime sectors**.
- Co-processed fuels when met the **Commission Delegated Regulation (EU) 2023/1640** on the methodology to track bio-carbon (as C14)

Advanced biofuels/RFNBO for maritime & aviation

- Advanced biofuels can contribute to the targets imposed by **ReFuel EU** and **FuelEU Maritime**.
- For **aviation**, a target of **70% of SAFs** towards 2050 has been set for both fuel suppliers to distribute SAF in increasing amounts over time, and to airlines companies to uplift (SAF-blended) aviation fuel at EU airports.

Total shares in the fuel mix (in %)	2025	2030	2035	2040	2045	2050
SAF ramp up:	2	6	20	34	42	70
Of which: sub-mandate on e-fuels	-	>1.2	5	8	11	28

- **Maritime** sector has the target of **80% GHGs reduction intensity by 2050** expressed in Well-to-Wake (WTW) (6% by 2030) - CO₂eqt emissions to account for all the life-cycle emissions (CO₂ , CH₄ , N₂O) of the different fuels and relevant engine technologies.

Specific rules as regards feedstock origin

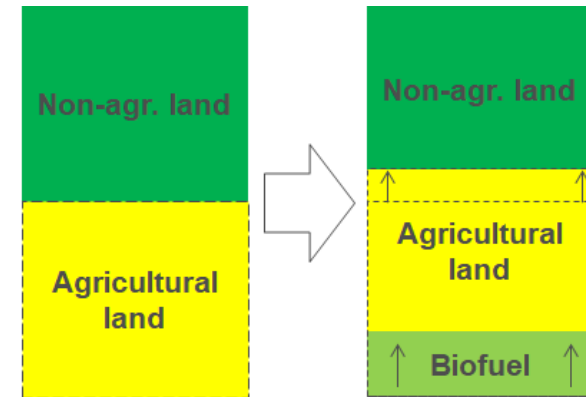
- The **share of biofuels and bioliquids and of biomass fuels** produced from **food and feed crops** and consumed in transport shall be no more than 1% higher than the share of such fuels in the final consumption of energy in the transport sector in 2020 in that Member State, with a **maximum of 7%** of final consumption of energy in the transport sector in that Member State
- The **share of high-ILUC risk biofuels, bioliquids or biomass fuels** produced from food and feed crops shall not exceed the level of consumption of such fuels in that Member State in 2019, unless they are **certified** to be low-ILUC risk biofuels, bioliquids or biomass fuels. From **31 December 2023 until 31 December 2030** at the latest, that limit **shall gradually decrease to 0 %**.



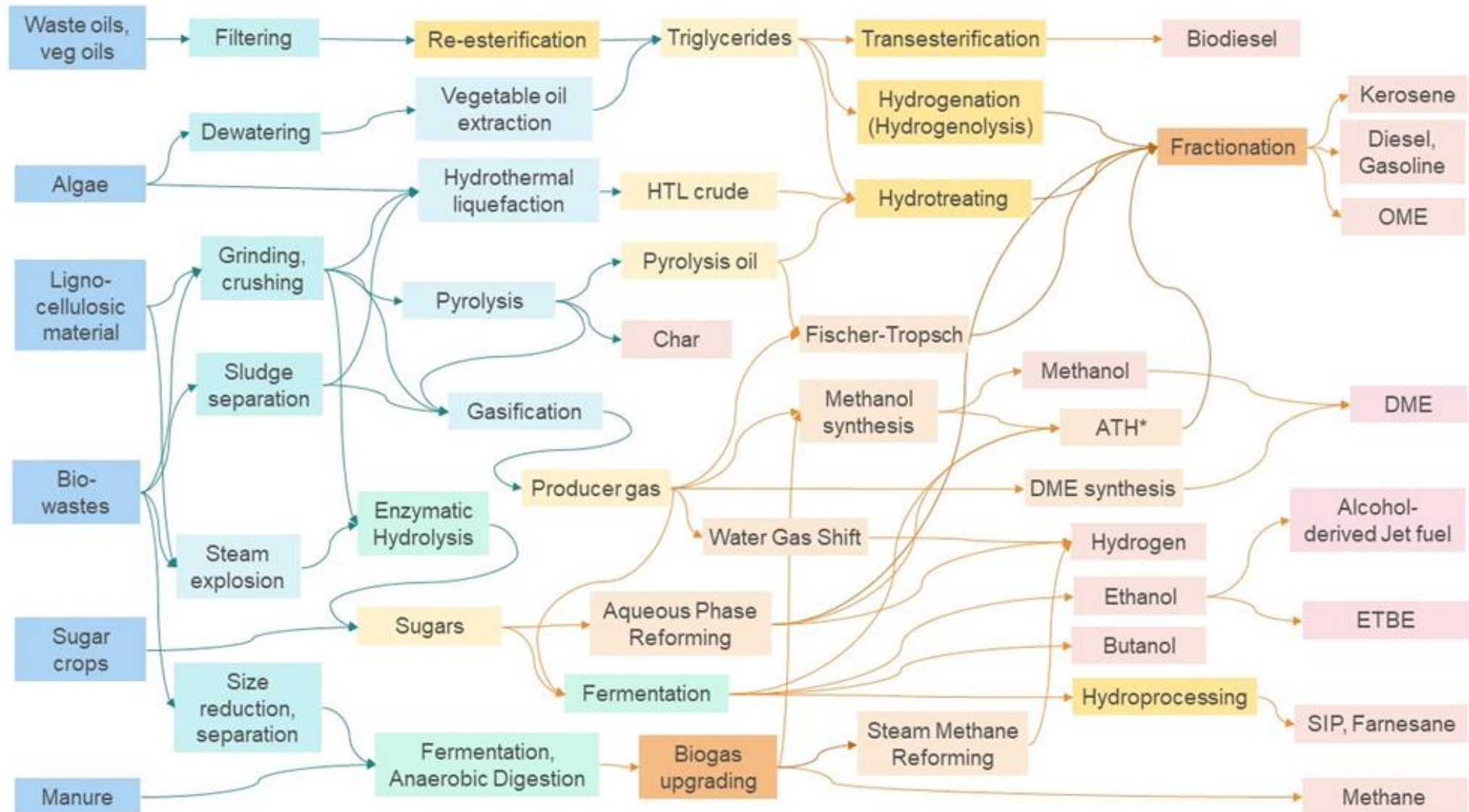
Source: <https://www.theedgemarkets.com/article/eus-indirect-land-use-change-approach-palm-oil-flawed-%E2%80%94-cpopc>

iLUC: a fundamental requirement

- **Commission Delegated Regulation (EU) 2019/181** identifies “**high-ILUC risk**” based on land expansion of biofuel, bioliquids or biomass fuels feedstocks into **high-carbon stock areas**.
- Conversely, biofuels, bioliquids or biomass fuels can be certified as “**low-ILUC risk**” if feedstocks used to produce them are: grown on abandoned or severely degraded land; cultivated using duly verifiable measures to increase productivity beyond the increases which would be already achieved in a business-as-usual scenario (additionality); grown by independent smallholders on plots of land smaller than two hectares.
- **Commission Implementing Regulation (EU) 2022/996** set the rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land use change-risk criteria on implementing rules for voluntary schemes under RED II (**Low-ILUC certification**).



Advanced biofuels pathways



Two Delegated Regulations within the RED

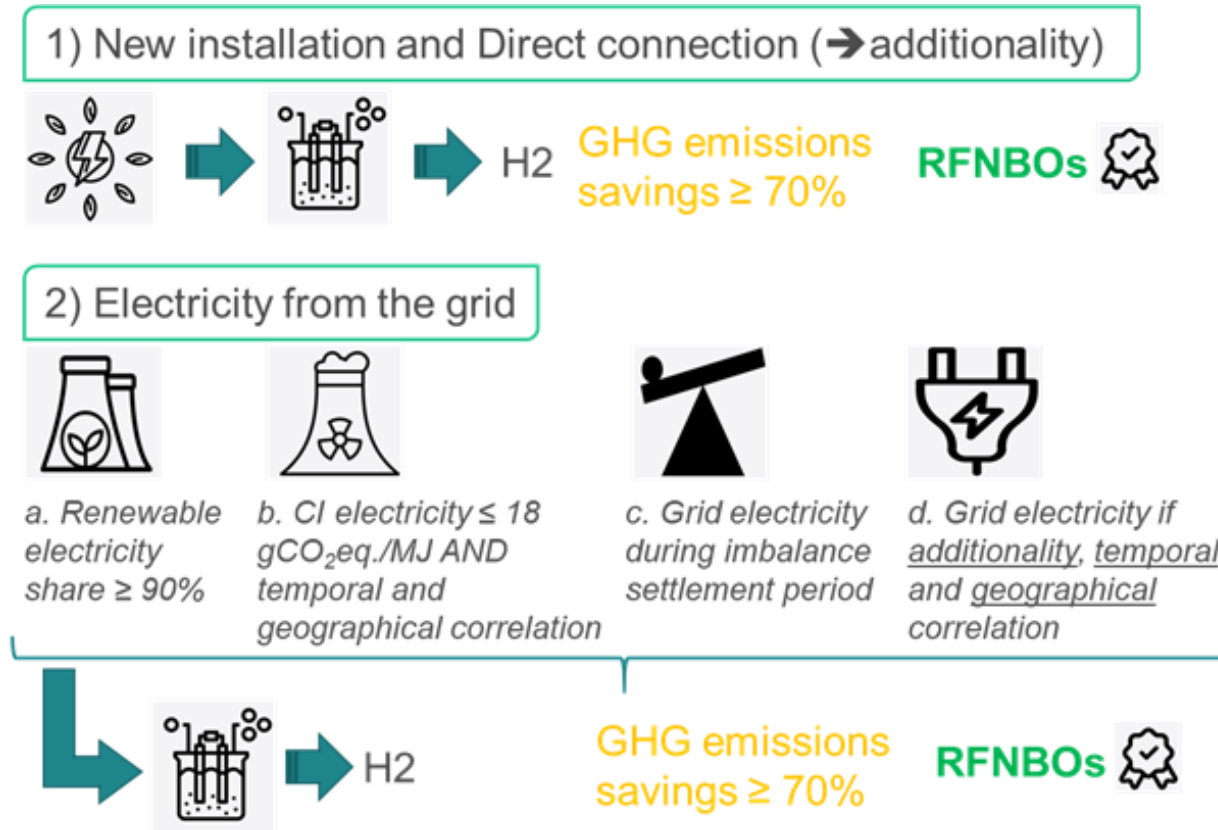
The RED regulates renewable energy sources across the EU economy.

The revised RED defines binding targets on the final consumption in transport of **renewable fuels of non-biological origin (RFNBOs)**.

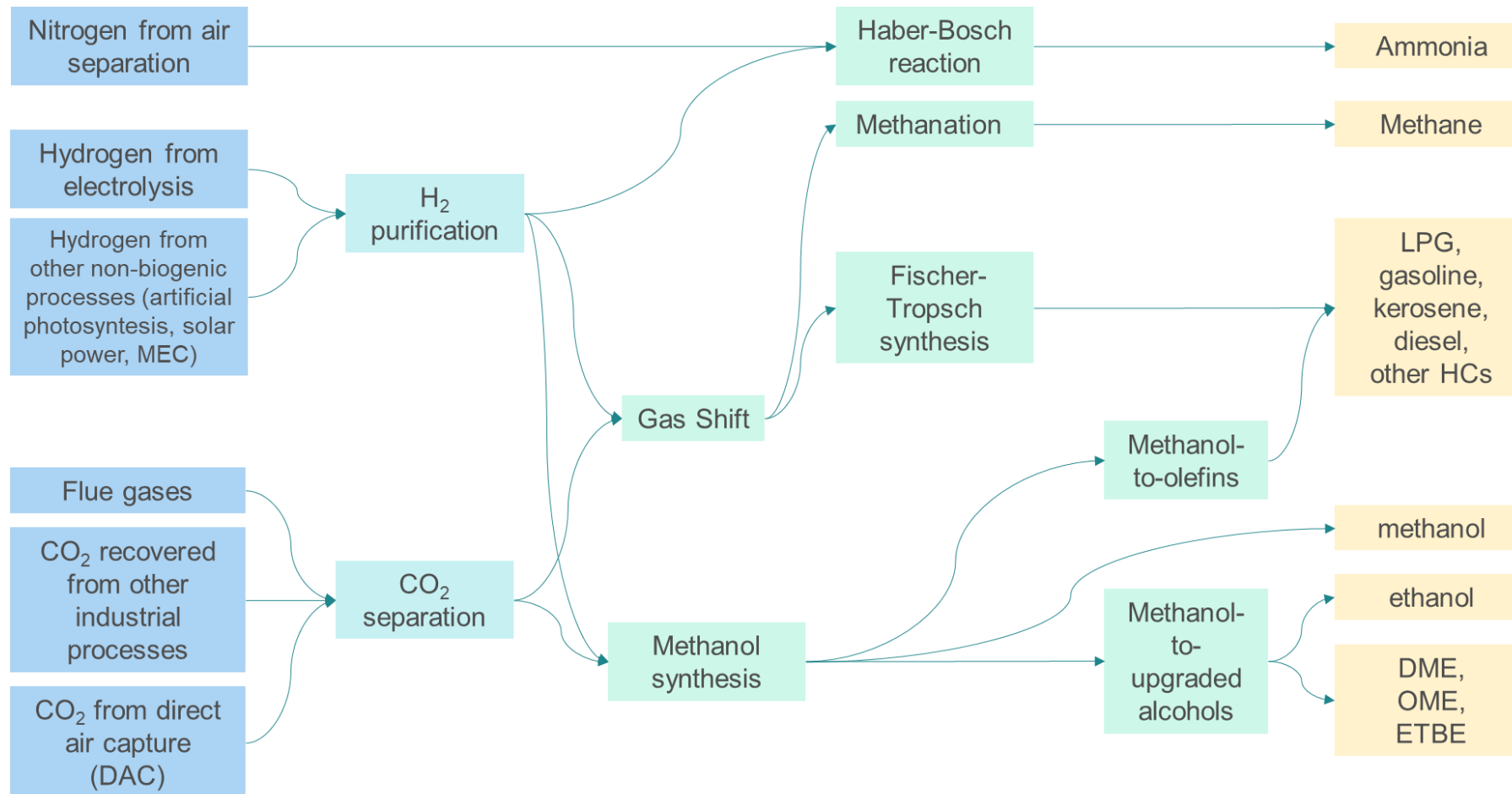
2 delegated regulations on RFNBOs set out the detailed rules:

- **(EU) 2023/1184** specifies the conditions under which electricity used to produce RFNBOs may be counted as truly produced from renewable sources (**additionality**) and achieves emissions savings based on **temporal** and **geographical** correlation criteria.
- **(EU) 2023/1185** sets the methodology to assess and calculate the lifecycle GHG emissions savings from RFNBOs.

GHG emissions accounting across the full lifecycle of the fuels, including upstream emissions, emissions offset from the previous use/disposal of carbon-based wastes, emissions associated with taking electricity from the grid, from processing, and those associated with transporting these fuels to end-user.



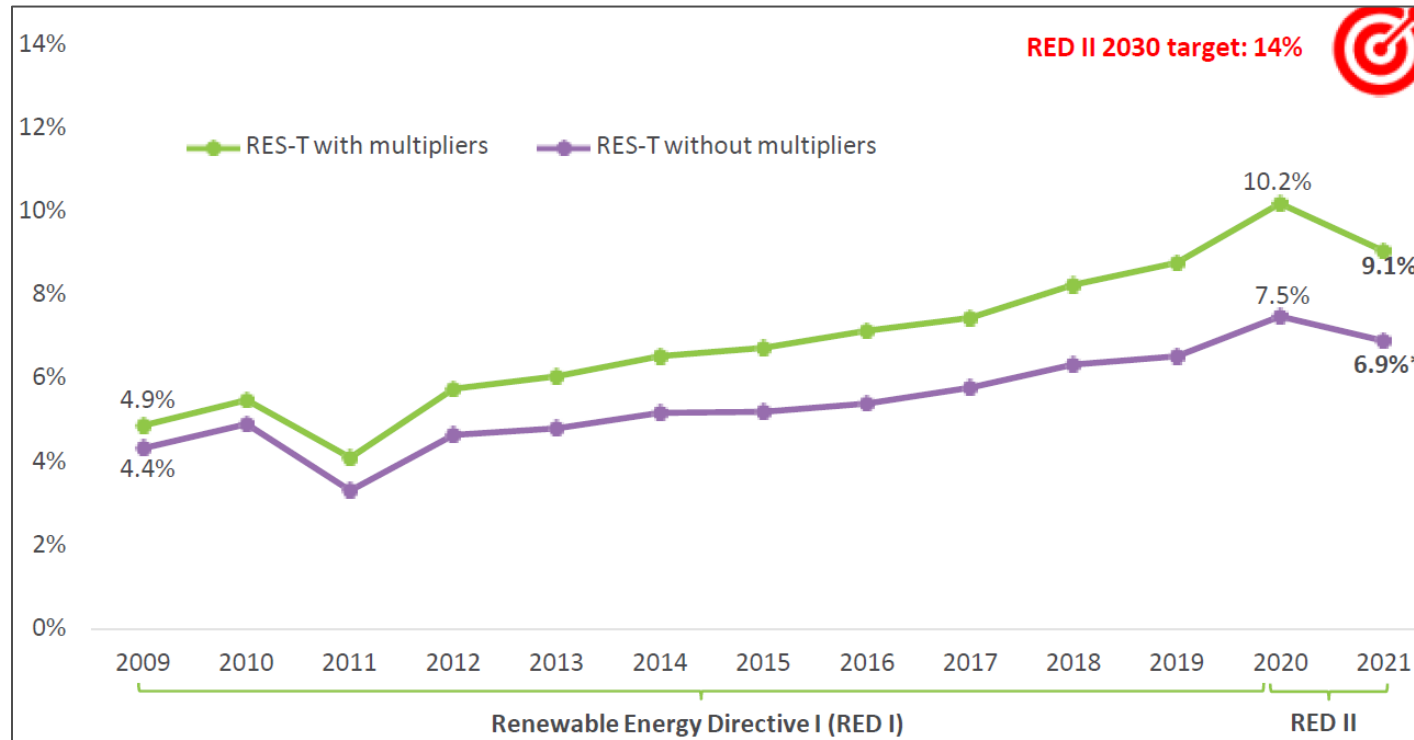
RFNBO pathways



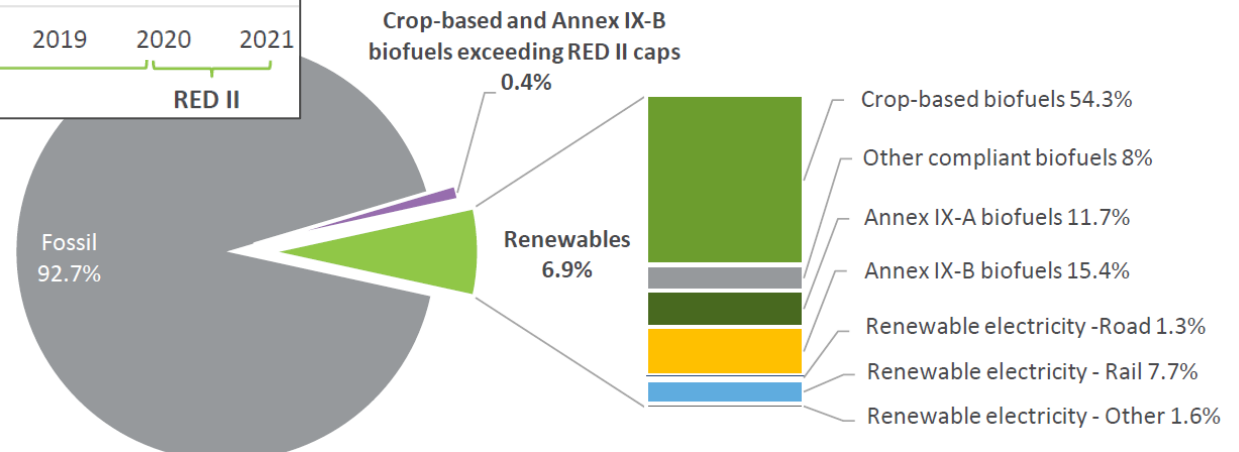
Fuels



Biofuels volumes in EU

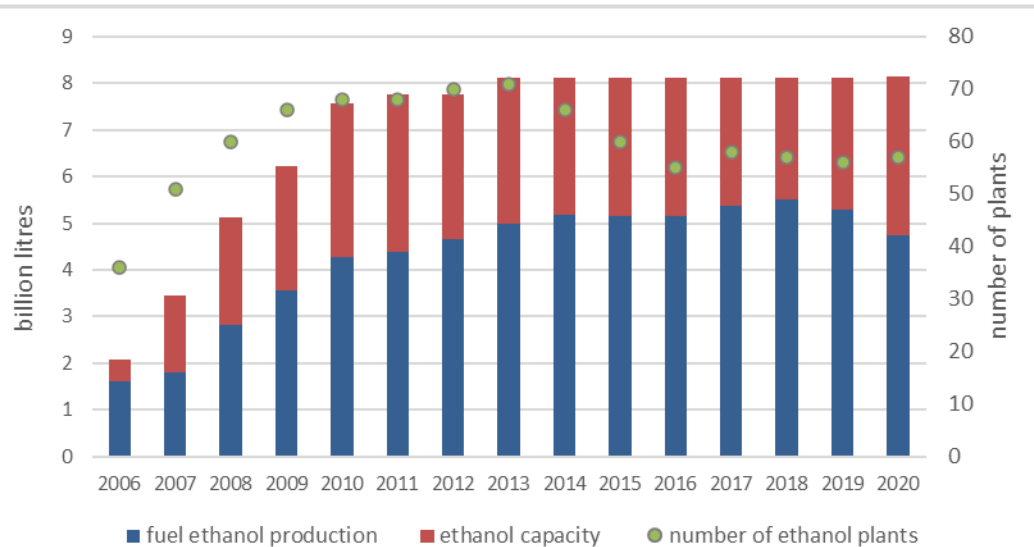


More info on:

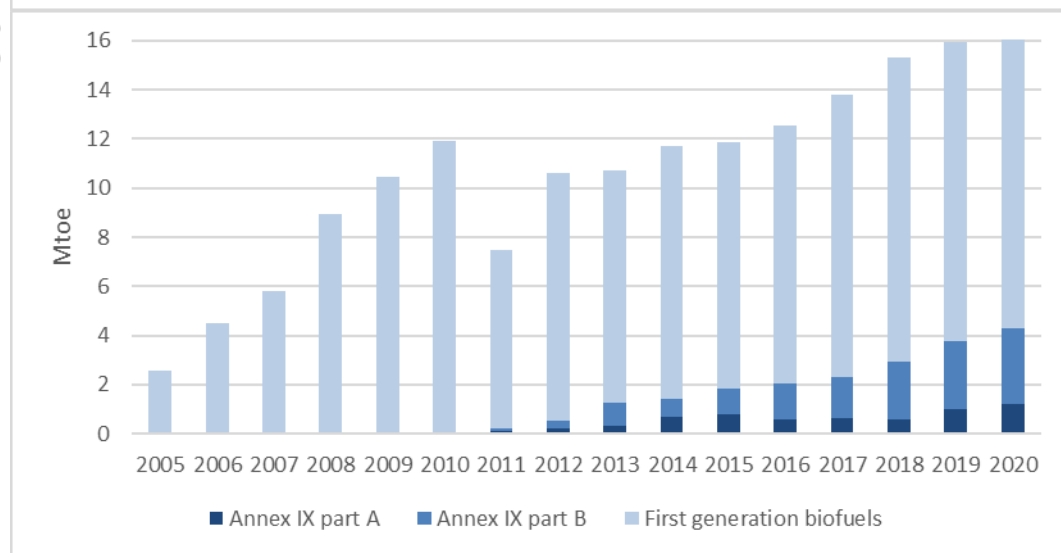
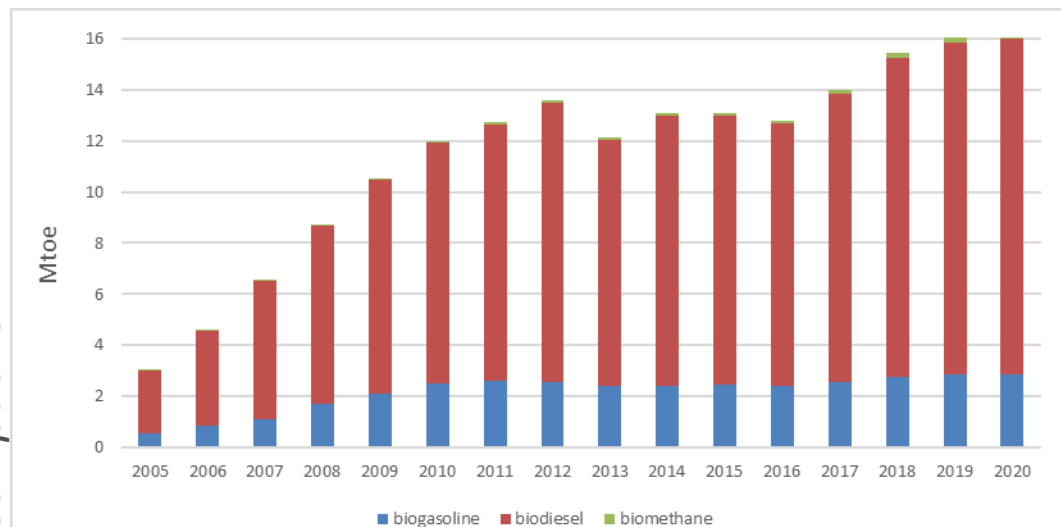


Biofuels volumes in EU

Production



Consumptions



Technology state of the art and market analysis

Support to Clean Energy Technology Observatory (CETO)

Reports on:

- ❖ **Advanced biofuels**
- ❖ Batteries
- ❖ **Bioenergy**
- ❖ Carbon Capture Utilisation and Storage
- ❖ Concentrated Solar Power and Heat
- ❖ Geothermal heat and power
- ❖ Heat Pumps
- ❖ Hydropower & Pumped Hydropower Storage
- ❖ Novel Electricity and Heat Storage
- ❖ Ocean energy
- ❖ Photovoltaics
- ❖ **Renewable Fuels of Non-Biological Origin**
- ❖ Renewable Hydrogen
- ❖ Solar Fuels (direct)
- ❖ Wind (offshore and onshore)

Technology Development	Value Chain	Market analysis
Technology Readiness Level	Turnover	Global&EU market leaders
Capacity & production	Gross value added	Trade
Costs	Sustainability	Resource efficiency and dependency
Public R&I funding	Role of EU companies	
Private R&I funding	Employment	
Patenting trends	Energy intensity&productivity	
Bibliometric Trends	EU Production	

+ EU R&I Impact & Trends



RED II: GHG accounting methodology

- **GHG emissions calculation** are available in the **Annex V & VI (part C) in RED II** (developed by JRC).
- The calculation model considers also **savings and credits** generated by some cultivation practices and/or initial feedstock (e.g. use of manure)
- Operators can use **default values** listed in Annex V and VI (only if Land Use change emissions = 0) to simplify calculation... or declare their **actual values**
- **Default values** include a “safety” factor of **40% increase** in emissions from processing compared to typical values
- **Disaggregated** default values are specified:
 - cultivation (with or without N₂O); processing; transport and distribution, total emissions
 - a combination of default for some production steps + actual for others can be used

JRC’ calculations are available at:

$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr}$$

where

E	=	total emissions from the use of the fuel;
e _{ec}	=	emissions from the extraction or cultivation of raw materials;
e _l	=	annualised emissions from carbon stock changes caused by land-use change;
e _p	=	emissions from processing;
e _{td}	=	emissions from transport and distribution;
e _u	=	emissions from the fuel in use;
e _{sca}	=	emission savings from soil carbon accumulation via improved agricultural management;
e _{ccs}	=	emission savings from CO ₂ capture and geological storage; and
e _{ccr}	=	emission savings from CO ₂ capture and replacement.

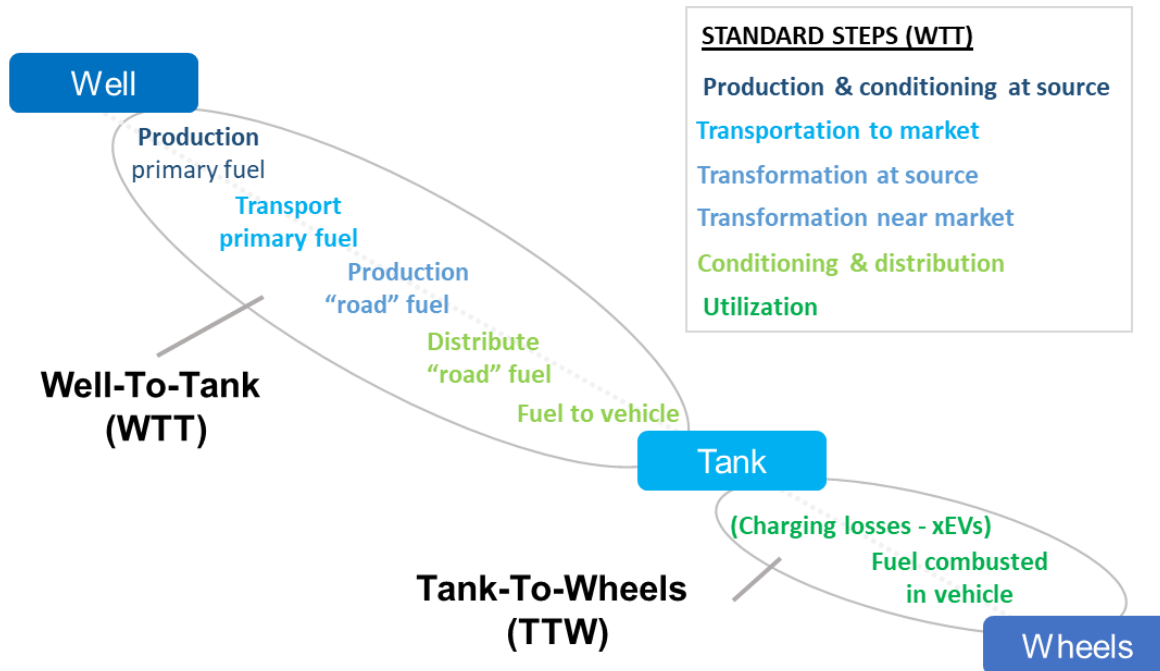
Emissions from the manufacture of machinery and equipment shall not be taken into account.

➤ **ANNEX V** - <http://data.europa.eu/89h/e51f4304-7023-4fca-8900-7d206f89b914>

➤ **ANNEX VI** - https://data.jrc.ec.europa.eu/dataset/jrc-alf-bio-bioenergy_jrc_annexvi_com2016-767_v1_july17

JEC Well-to-Wheel

- *JRC-Eucar-Concawe Well-to-Wheel study version 5 is a long-standing collaboration between the European Commission's Joint Research Centre, EUCAR and Concawe*



Establish

in a **transparent** and **objective** manner
a consensual **Well-to-Wheels** assessment of:

- energy use
- and
- GHG emissions

for a **wide range of automotive fuels and powertrains**, relevant to Europe in 2025+

Analysis updated as technologies evolve
Common methodology **and** data-set

WTT > 250 Resource to fuel pathways
TTW > 60 powertrains solutions

WTW > **1500** potential combinations!

Conclusions

- EC is accelerating the **EU climate, energy and environmental legislation** and supports the development of the market for **advanced biofuels** and **RFNBO/RCF**.
- Advanced biofuels can be a **sustainable solution for hard-to-abate sectors** as aviation and maritime, and the GHGs reductions can be significant.
- Today, traditional biofuels (1G) still cover the larger part of bio-based fuel production & use.
- Conversion technologies at high TRL such as **HVO** and **co-processing** can cover large liquid adv. biofuels demand, and **FT-gasification** and **2G Ethanol** are still limited due to undeveloped non-food biomass value chains and competition with biomethane feedstock.
- A **rapid biomethane market uptake** is expected, passing from 13 bcm (current production) to 35 bcm by 2030.
- **E-fuels (RFNBO)** and **RCF** can play a significant role in the upcoming years, but still limited for the absence of hydrogen supply and CO₂ recovery options and opportunities.

Keep in touch



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Thank you

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