BELLONA EUROPA

RECYCLING FOSSIL CARBON TO MAKE TRANSPORT FUELS DOES NOT FIT LONG TERM CLIMATE TARGETS

Fossil fuel-based products such as plastics that are discarded will largely end up in landfills, the natural environment or incinerators[1], all of which have a significant climate impact through emissions of CO_2 and methane. In the past few years, other options for the disposal of plastic waste have come into focus. For example, the thermal processing of fossil plastics via processes such as pyrolysis and gasification results in combustible hydrocarbons that can be further refined into fuels like petrol, diesel, and similar oil products[2].

In the Renewable Energy Directive (RED)[3], these fuels are known as recycled carbon fuels or RCFs[1]. However, the limitations of these fuels boil down to their fossil origin and the resulting limited scale of emission reductions they can provide. This short briefing will outline why fossil RCFs need to be regulated by means other than climate policies, such as the RED.

RECYCLED CARBON FUELS IN THE EU POLICY FRAMEWORK

RCFs are included in the EU policy framework through the RED revision, which allows them to contribute towards transport targets: *"recycled carbon fuels can contribute towards the policy objectives of energy diversification and decarbonisation of the transport sector where they fulfil the appropriate minimum greenhouse gas emissions savings threshold"*[4].

The REDII is intended to be a common framework for the promotion of energy from renewable sources (defined as "energy from renewable non-fossil sources" in that very Directive) in the electricity, heating and cooling, and transport sectors. However, the inclusion of RCF-fuels derived from fossil waste therefore does not fit within this framework intended to meet net zero GHG through uptake of renewable energy sources, as fossil waste sources are not renewable.

Moreover, it does not fit the ambition of significantly reducing GHG emissions (i.e., by more than 70% compared to the fossil fuel comparator). Overall, pathways to full carbon neutrality should be favoured over large scale RCF deployment and fossil fuels use in general.

CLIMATE IMPACT OF RCFS

RCFs do not keep emissions away from the atmosphere. Although there may be a hypothetical reduction of virgin fossil fuel use in the system, CO_2 still enters the atmosphere upon combustion of the fuel and has to be accounted for. In other words, the fossil carbon content of the waste is refined into a different form, turned into

1 The definition of recycled carbon fuels in the RED is as follows: "'recycled carbon fuels' means liquid and gaseous fuels that are produced from liquid or solid waste streams of non-renewable origin which are not suitable for material recovery in accordance with Article 4 of Directive 2008/98/EC, or from waste processing gas and exhaust gas of non-renewable origin which are produced as an unavoidable and unintentional consequence of the production process in industrial installations"

fuels and combusted upon use, thereby releasing the fossil carbon content into the atmosphere.

Pyrolysis and gasification of waste plastics, from a case-by-case perspective, offer varying results in terms of final energy content and emissions savings. However, considering the entire value chain and aggregating associated emissions, the process is highly likely to result in additional emissions, along with the final fossil carbon emitted, that need to be taken into account. Taking into account the entire lifecycle, the overall reductions in emissions brought about by RCFs versus virgin fossil diesel are around 1-14%[5]. The EU Green Deal[6] hopes to cut all transport emissions by 90% by 2050. Thus, RCFs originating from a fossil waste source cannot provide emissions savings that match the scale and pace of the EU's targets, because even if 'recycled' or 're-used', the CO_2 would still be emitted in the transport sector when the fuel is combusted.

The below diagram[7] shows the processing of waste feedstock[2] containing post-consumer plastic waste. It charts the progressive loss and emission of CO_2 during the production process. This conversion of waste back to basic chemical building blocks for fuels and other products results in a 54% CO_2 'loss' across the process. These emissions may vary depending on the type of waste used, temperature and pressure requirements. Nevertheless, these emissions need to be taken into account when calculating the full climate impact of RCFs.

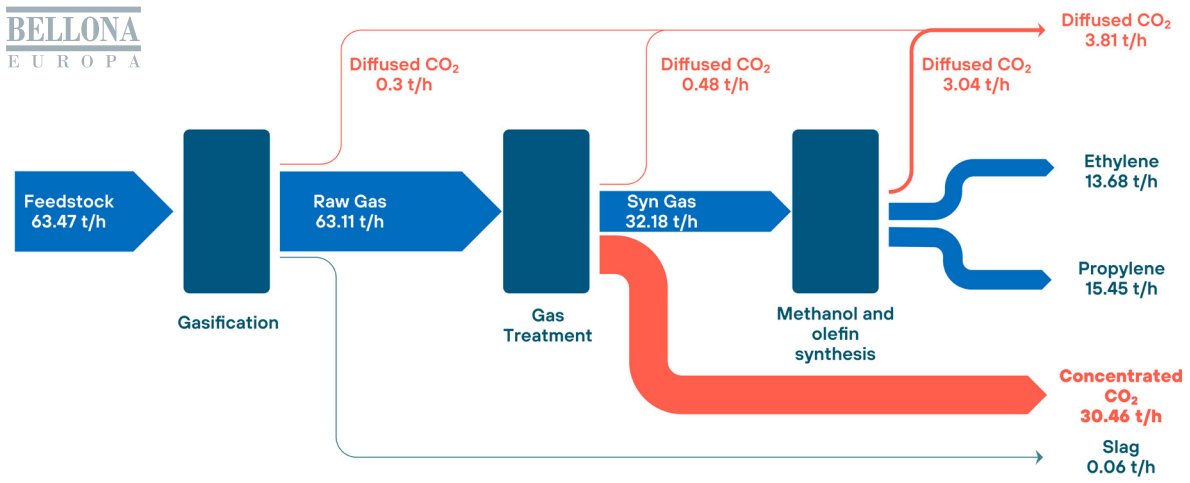

Figure 1: Carbon flow diagram for olefin production with refuse derived fuels (without electrolysis), Seidl et al. (2021)[7], remade by Bellona.

The process of converting waste plastics to fuel is an energy intensive one. Nearly half the energy content from simple mixed plastics (SMP) input into a rotor kiln pyrolysis is lost during the process[6]. 25% of the input energy is used to provide the heat for the pyrolysis process itself.

2 The graph shows the material flow for the gasification of refuse derived fuels.

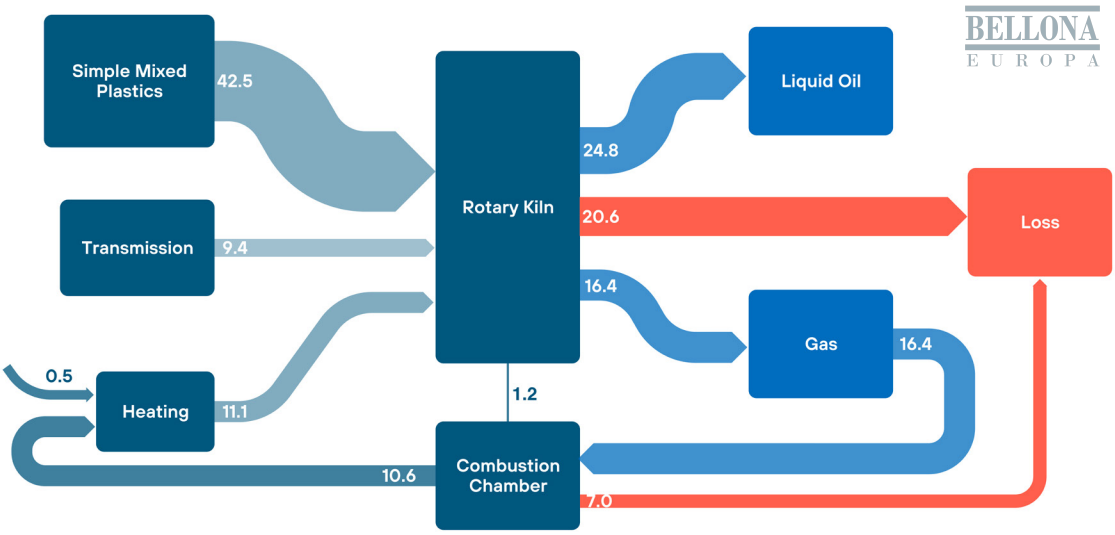

Figure 2: Energy Sankey diagram of simple mixed plastics in a rotary kiln in MJ (remade by Bellona)[8]

RCFS AND THE EUS CLIMATE PATHWAY

Current trajectories of EU legislation are at odds with the REDII's optional involvement of RCFs in transport targets. Firstly, the Waste Framework Directive[9] (WFD) establishes a hierarchy which prioritises mechanical recycling and establishes high targets for the same in a push to further the EU circular economy vision. This provides little to no incentive to pursue thermal processing over mechanical recycling, leaving little room for RCF deployment.

Secondly, the recent regulation[10] that bans the sale of new internal combustion engines for passenger vehicles from 2035 reiterates the EU focus on zero emission mobility. Investments are shifting away from conventional fuels and towards electrification and different modes of transportation, especially when it comes to road transport. Member States promoting RCFs would encourage investment in a process that would soon be obsolete for a great portion of the transportation market.

RECOMMENDATIONS

1. Ensure that any assumed emissions reductions due to RCFs are clearly accounted for only once, either in the transport sector, or in the industry sector where the waste gases may be coming from. If the emitted carbon cannot be accounted for where it is 'captured' (e.g., post-consumer plastic waste), it should be counted upon the combustion of the fuel.
2. Ensure that RCF deployment is limited and does not risk stranded assets. The shift towards zero emissions transport should prioritise the most efficient options and minimise the use of liquid fuels such as RCFs where possible.

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