BRIEFING - July 2024

IMO - Sustainable Fuel Criteria

Sustainable fuels criteria

Alternative marine fuels come with different well-to-wake (WtW) GHG footprint. Currently there are no fuels in production that can deliver zero GHG on a life-cycle basis. But some renewable fuel pathways do have the potential to eventually reach that target, while others will always have substantial residual emissions in the production chain.

To provide certainty for renewable fuels that could theoretically deliver IMO Revised Strategy's mid and long-term decarbonisation objectives – while minimising the risks of stranded assets for the fuel and technology options that cannot – **it is essential to introduce a robust GHG reduction criteria to the definition zero and near-zero emission fuels**. We propose introducing the following transitional GHG reduction thresholds to qualify as such.

Sustainable fuels are electrolytic hydrogen-derived fuels that deliver:

- At least 90% WtW CO_{2e} emissions reduction relative to the fossil fuel baseline from 2030 onwards, or a maximum of 9.4 gCO_{2e}/MJ of energy GHG intensity;
- At least 95% WtW CO_{2e} emissions reduction relative to the fossil fuel baseline from 2040 onwards, or a maximum of 4.7 gCO_{2e}/MJ energy GHG intensity;
- 100% WtW CO_{2e} emissions reduction from 2050 onwards.

Such a definition would ensure that only the fuels with long-term full decarbonisation potential, especially those derived from electricity, are promoted through the IMO GFS without prescribing the specific type of on-board conversion technology to be used, e.g. dual-fuel or mono-fuel engines or low or high-temperature fuel cells.

Sustainable fuels & renewables requirements

The production of electrolytic hydrogen-derived fuels requires a source of electricity which should be decarbonized and come *in addition* to the decarbonisation requirements of the electricity grid. This last point is especially important as the objective is to ensure the production of sustainable fuels does not rely on renewables that are already used to decarbonize the electricity consumption in other sectors of the economy.

Should the production of sustainable electrolytic hydrogen-fuels rely on electricity originating from the grid, this implies that the grid should be almost fully decarbonised in order to produce very low GHG intensity H2-derived fuels that could meet the suggested thresholds. In fact, grid-connected hydrogen-based e-fuel production would already require renewable and/or low-carbon (i.e. nuclear) electricity to make up over 90% of the power mix in order to meet the 70% GHG intensity-reduction threshold.[1] With a reduction threshold of 90%, this would necessitate the grid to be completely decarbonized, or for fuel production facilities to be directly connected to renewable power sources. In reality, this means that **relying on electricity from the grid to produce e-fuels with strict sustainability requirements would not be feasible today** (figure 1) in almost any country.[2] This also means that using a 90% GHG reduction threshold[3] would eliminate the risk of marine e-fuels production diverting green/clean electrons from decarbonising the grid. In other words, a high threshold would ensure both sustainability and additionality under one single mechanism.

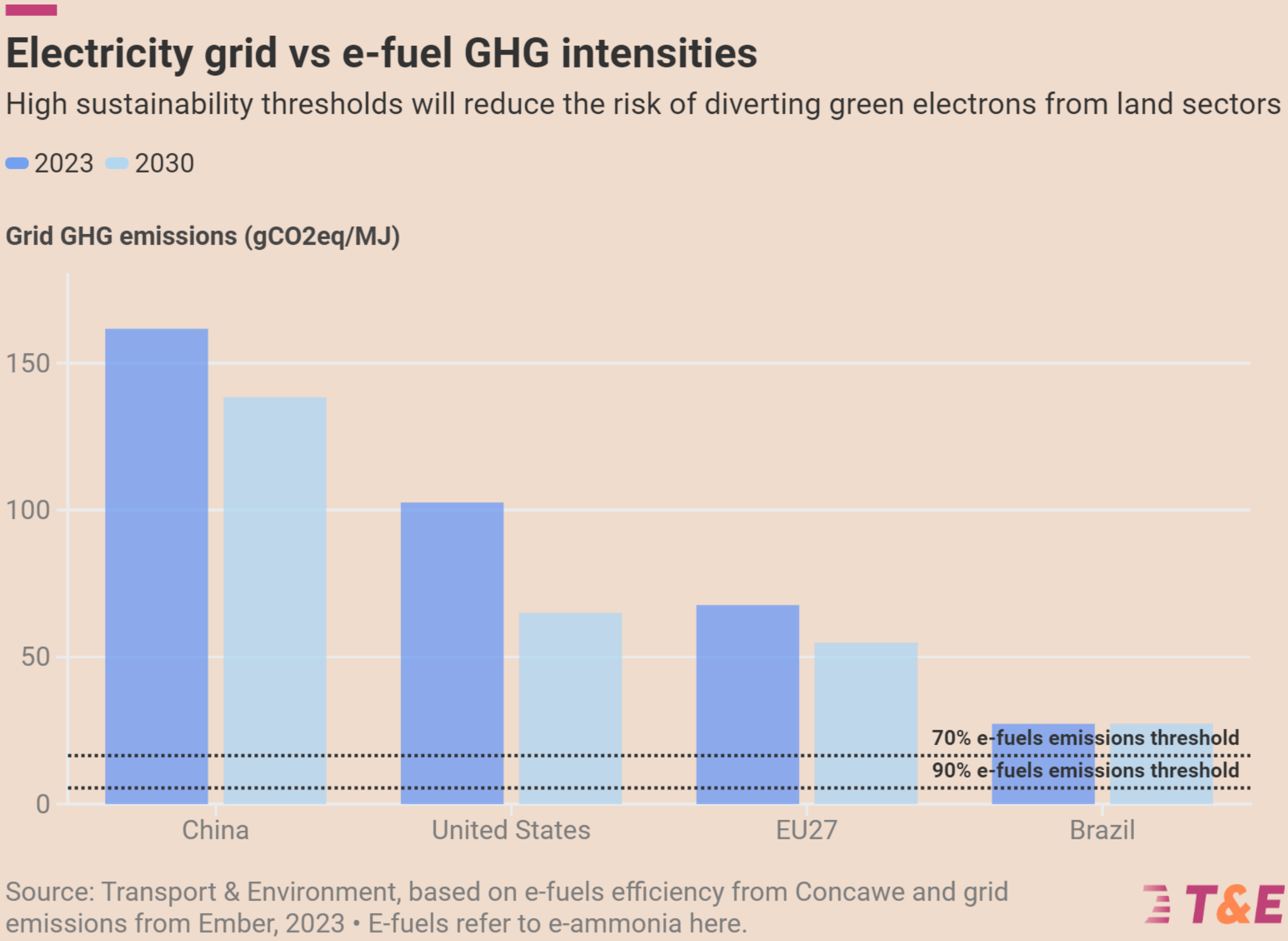


Figure 1: Grid emissions vs electricity emissions based on different sustainable e-fuels emissions thresholds

[1] Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1184

[2] International Energy Agency (2023). Towards hydrogen definitions based on their emissions intensity https://iea.blob.core.windows.net/assets/acc7a642-e42b-4972-8893-2f03bf0bfa03/Towardshydrogendefinitionsbasedontheiremissionsintensity.pdf

[3] or a maximum of 9.4 gCO_{2e}/MJ GHG intensity

For comparative purposes, figure 2 demonstrates the potential impact of other GHG reduction thresholds on the eligibility of alternative fuel. **An 80% GHG reduction threshold would disqualify any fossil fuels from complying by a large margin** for the zero or near-zero emissions energy uptake targets. It would also make some biofuels ineligible. For example, biomethane produced from biowaste can only deliver about 77.9% emissions reduction compared to the fossil fuel baseline.[4] This would even be the case if biomethane was used on a ship equipped with a 2-stroke high pressure engine (generally regarded as the LNG dual-fuel engine type with lowest methane slip).[5] On the other hand, popular biofuel feedstock such as used cooking oil (UCO) would comply, although a margin error would remain given that the reduction potential is estimated to be 82.6%. This could be an issue, given that the demand for UCO – notably from road transport and aviation – far outstreaps existing feedstock availability and there is growing evidence for fraudulent supplies (see information box below).

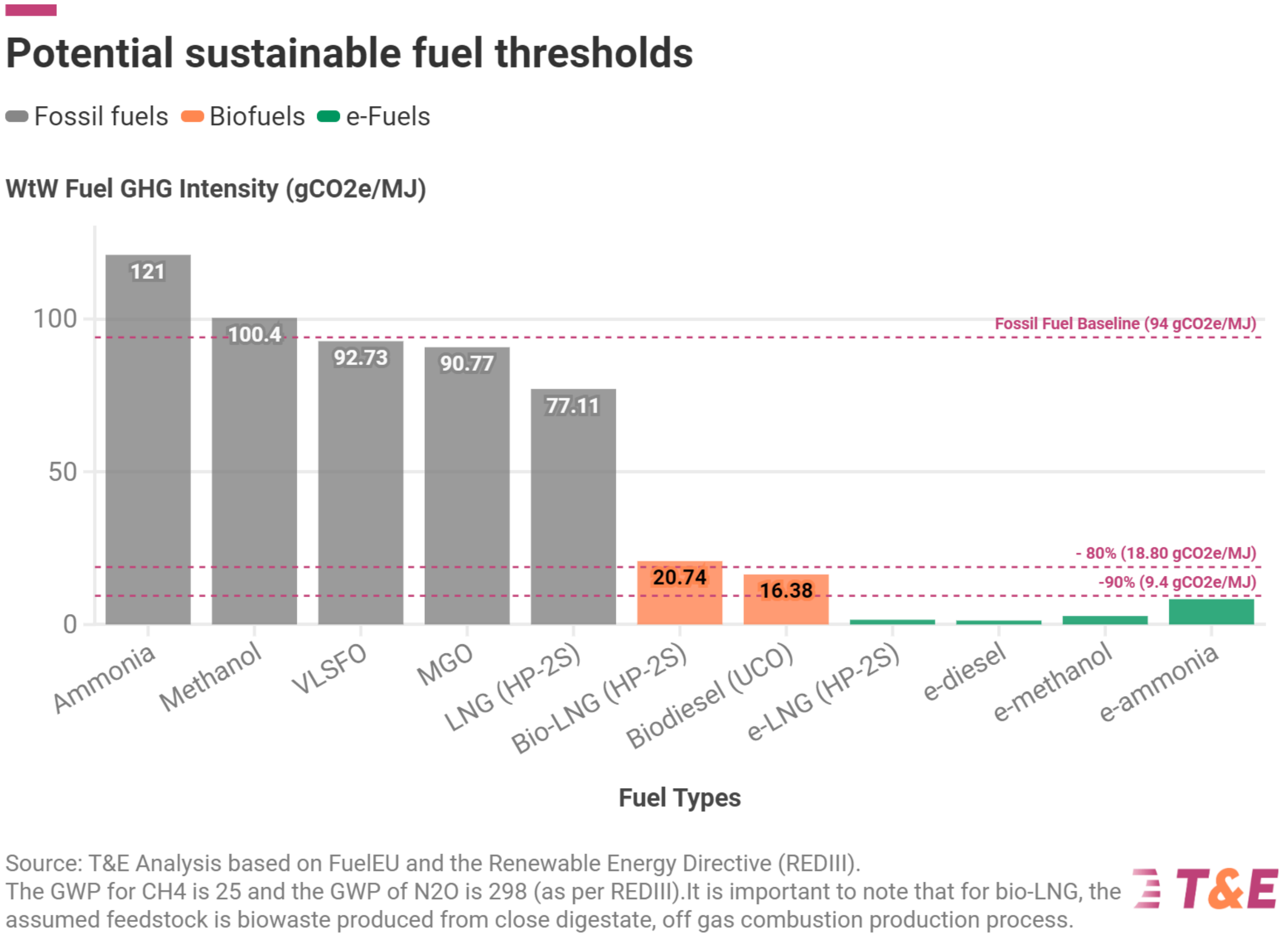


Figure 2: Potential sustainable fuels thresholds compared to a fossil fuel baseline at 94 g CO_{2e}/MJ

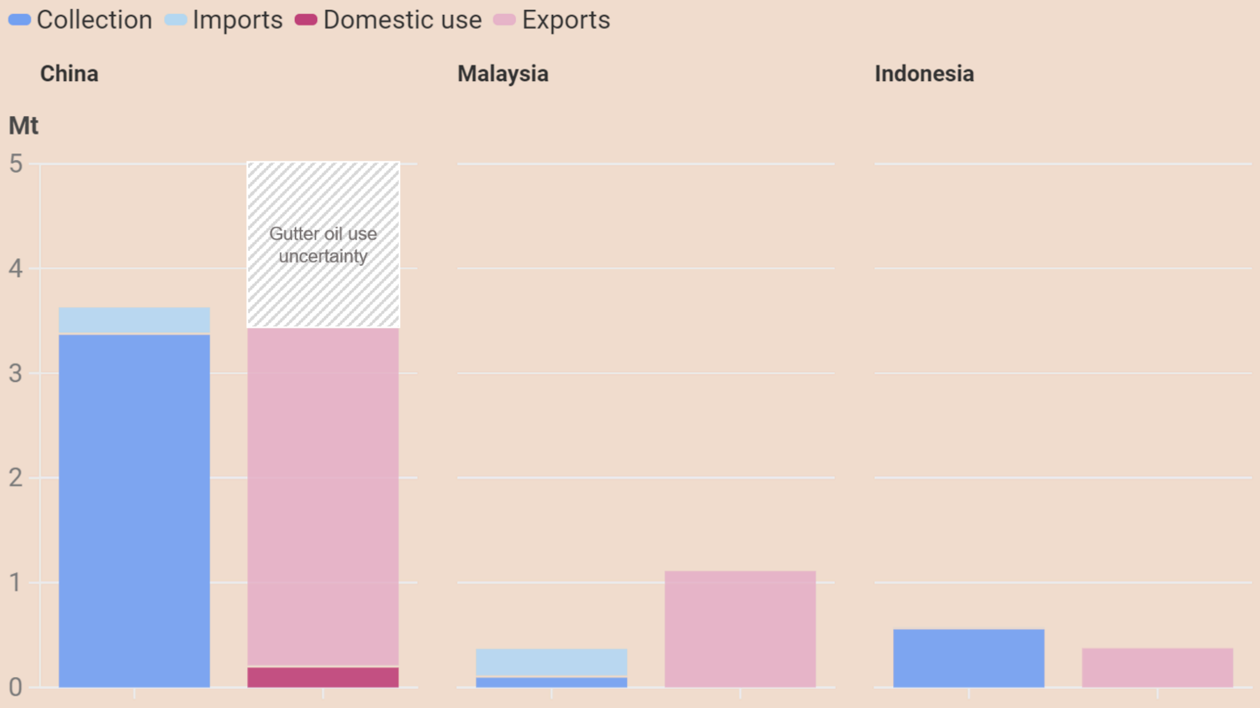
[4] Biowaste produced from close digestate, off gas combustion production process using the lowest GHG intensity of 14 gCO_{2e}/MJ https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001 (page 328). It is important to note that biomethane can be produced from different feedstocks some of which could comply under the 80% GHG reduction threshold.

[5] According to the IMO 4th GHG Study, the engine type with the lowest methane slip is the High-Pressure Two-Stroke (HP 2S) engine with a methane slip of 0.15% of the fuel (0.2 gCH4/kWh). This would result in a WTW Fuel GHG Intensity of 20.54 gCO_{2e}/MJ (implying a 78.15% reduction threshold). The methane slip assumption in the EU is slightly higher (0.20% of the fuel) which is why the graph indicates 20.74 gCO_{2e}/MJ (or 77.9% reduction threshold).

Used Cooking Oil: A slippery slope

Sustainability criteria allowing UCO to comply as a feedstock for shipping would be problematic. Increasing demand for UCO has resulted in US and European imports from Asia, showing that **UCO collected locally is not available in sufficient quantities**. In addition, a comparison between UCO exports data from the main exporter countries (China, Malaysia and Indonesia) to those countries' UCO imports, domestic consumption and collected waste oil volumes do not appear to match (figure 3). This raises strong suspicions over whether virgin vegetable oils, such as palm oil, are being mislabelled as waste oils, potentially associated with indirect land use change with negative consequences for the climate and biodiversity.

Discrepancy between UCO collection and exports suggests likely fraud



Source: Transport & Environment, based on data from Stratas Advisors and the ICCT

Figure 3: 2023 collection, imports, exports and domestic uses of UCO and UCO biofuels

Provided that UCO was only made up of used cooking oil, its potential as a fuel feedstock would remain limited. In fact, the collected volumes potential would remain small compared to the demand, especially considering the demand for the aviation sector to produce Sustainable Aviation Fuel (SAF). In 2023, China collected 3.4 Mt (million tonnes) of

UCO, and would only be able to collect an extra 2.5 Mt, resulting in 5.9 Mt per year (figure 4).[6]

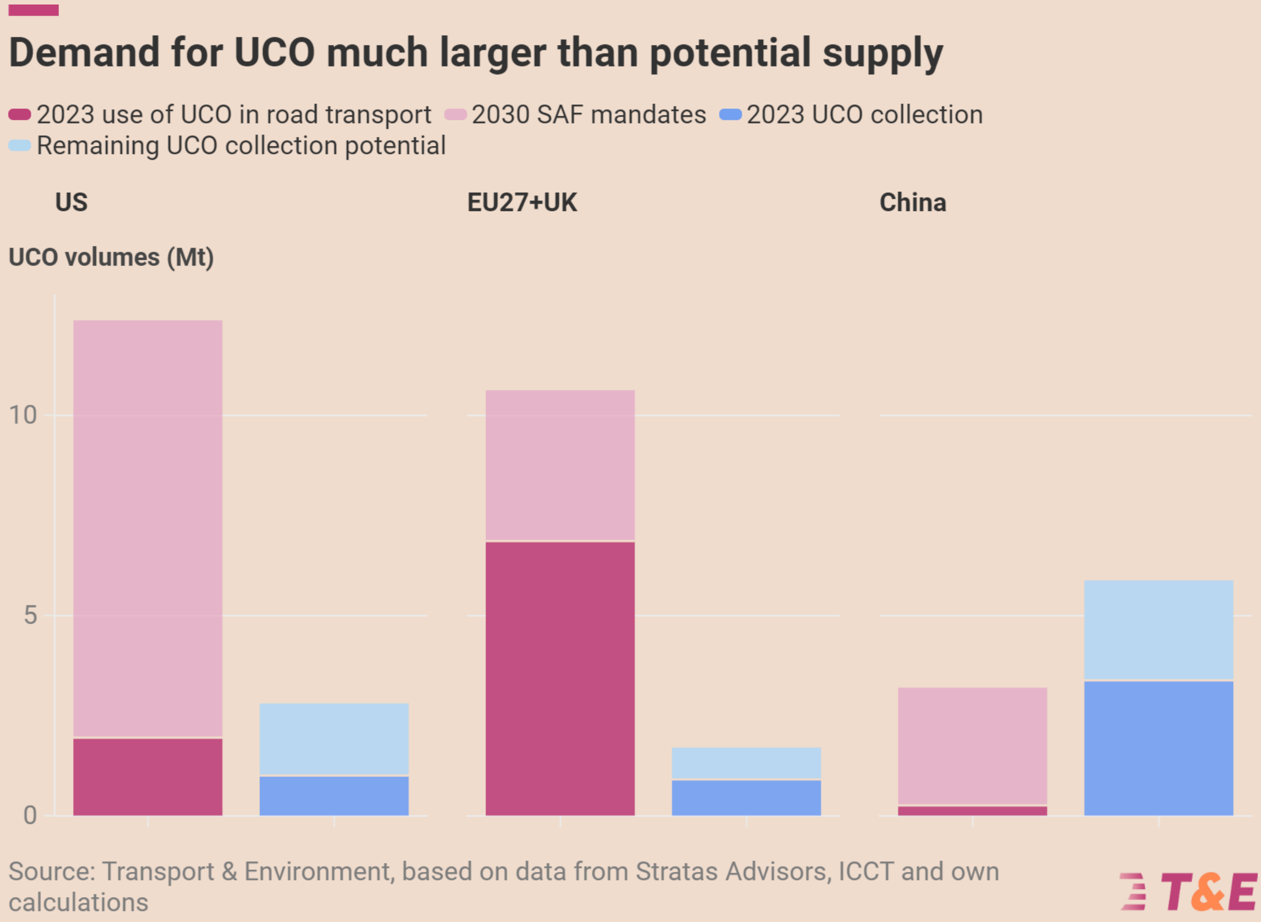


Figure 4: Current and projected demand for UCO biofuels vs collection potential

[6] For more information on used cooking oil, please check T&E's briefing

Further information

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