

Transport and Environment submission to the ETS [Innovation Fund](#) of 4 Billion Euros earmarked for breakthrough technologies and technical rollout of new technologies.

Summary

Aviation and shipping fuels need solutions for decarbonisation. Biofuel blends can contribute but experience in the road transport sector shows that the need for strict sustainability criteria and ILUC conditions means only advanced alternative fuels will deliver credible GHG savings and that the supply of such feedstocks is far too limited. It is essential that the transition to renewable synthetic (e-fuels) fuels for both sectors be kick-started by the development of pilot production plants.

To drive the decarbonisation of the aviation sector, we need the scaling of production plants for manufacture of synthetic kerosene from renewable energy combined with carbon capture and utilisation of CO₂ from direct air capture utilising the fischer tropsch process to synthesize hydrocarbons. For shipping it means the production from renewable energy, in place of fossil fuels, of hydrogen and hydrogen carriers such as ammonia. Ammonia can be used as a hydrogen carrier for fuel cells as it is easier to store or as fuel for direct combustion in internal combustion engines. It can play a key role in decarbonising transport fuel, domestic fuels, heat generation, etc.

The Innovation Fund is well placed to play a critical role in supporting the development of these pilot plants and subsequent testing prior to scaling up.

Aviation

Aviation emissions globally are growing at unprecedented rates and the sector accounts for over 5% of global warming and 3.4% of EU CO₂. EU growth at over 6% annually will see aviation consume an increasing share of European emissions and jeopardise the Paris Agreement goals. As will the sector's non-CO₂ climate effects (equal to or in excess of their CO₂ effects) which are entirely unregulated.

No effective measures are in place to address these aviation trends. More worryingly, none are on the political agenda. The ICAO offsetting mechanism, starts voluntarily in 2021 and will have no impact on aviation CO₂. At best, the price effect of purchasing CORSIA offsets will hardly represent not [even 1%](#) of fuel costs in 2030 - well short of what's required to incentivise the uptake of sustainable alternative fuels. Offsetting has, [for the most part](#), failed to reduce emissions in other sectors and supply will become even more difficult as states pursue their own reduction requirements under the Paris Agreement. In Europe the ETS is yet to drive emission reductions due to a large overhang in allowances. Overall the sector is grossly undertaxed because of fuel tax and VAT exemptions which act as subsidy and fuel growth.

Within the sector itself, air traffic reforms in Europe continue to fail to deliver and technology /efficiency gains already well less than 2% per annum, will progressively decline as the

boundaries of physics governing aircraft design are further tested. Electric flight is more than a generation away and only conceivable for very short haul/general aviation. Fast train can already do that job. Revolutionary technologies will not appear for many decades while fleet turnover rates and manufacturers' determination to recoup ever higher investment costs means that today and tomorrow's technology will be with us until well beyond 2050. For the moment, demand moderation policies beyond taxation – which will realistically only slow growth – are not on the agenda. Industry grossly overestimates the potential of biofuels' both volume wise and in emissions reductions. Most biofuels offer no sizeable reductions. Experience at ICAO underscores the challenges of regulation.

Is there a low/zero carbon drop-in fuel that avoids the sustainability and supply constraints of biofuels? Hydrogen would involve enormous investments and risks for manufacturers in a totally new aircraft and vast airport refuelling infrastructure costs. Electrofuels such as power-to-liquid for aviation are, on the other hand, starting to receive close attention – driven by the continuing fall in the price of renewables and the growing imperative to decarbonise all sectors due to the requirements of the Paris Agreement. There are many challenges – not least the vast amount of energy required, the price gap with conventional fuels and the need for robust safeguards relating, for example, to the source and accounting for CO₂. But the Fischer-Tropsch technology used also for aviation biofuels has been around for over 90 years and is TRL8.

What is needed is first, a sober understanding of the physical limits to technology development in aviation, an appreciation that even with effective taxation and measures such as the ETS, aviation emissions growth is here to stay and that, if there is any solution within the Paris timeframe, it may well only be a low/zero carbon drop-in fuel. Power to liquid can be sustainably produced to have zero carbon. The issue is not technology per se but political acceptance of the concept and a serious effort to address questions of supply, proof-of-concept, scaling up, energy/cost requirements in production and the price gap with kerosene – which gets us back to taxation and market – based measures.

For a host of reasons - lack of legal authority, no budget, questionable record on environmental integrity etc, ICAO is not the venue to advance the take-up of electrofuels. The EU on the other hand has a long experience with developing policies and promoting alternative fuels and has a robust decision-making process and access to R&D funds. It would seem that the EU is best placed to take the lead to incentivise pilot-scale production facilities followed by inflight blend testing etc. We do not see such initiatives being taken elsewhere. Inclusion of power-to-liquid in the Innovation Fund wont be a sufficient step - safeguards and greater levers for deployment such as fuel mandates would seem to be required. At this stage the great need is to establish the credibility of the e-fuel option; prove the production and in-flight concept and so enable policy-makers to start factoring in e-fuels in decarbonisation plans. The e-fuels option constitutes a completely new possibility to address aviation's carbon footprint and one that the Commission and Member States may well come to realise while not a silver bullet could potentially be a game-changer.

Linkages could be established with European Structural and investment funds to take investment in production facilities to the next level. These bodies could also complement funding mechanisms to establish facilities in developing nations where abundant sources of renewables (solar, wind, hydro) could be used for synthesis. The Innovation Fund is the ideal and possibly only vehicle on the horizon that can put a zero carbon drop-in fuel on the aviation decarbonisation agenda.

Shipping

International shipping carries around 90% of world trade and is responsible for roughly 3% of global greenhouse gas emissions. It is the backbone of global business. We include the shipping sector because current propulsion is almost 100% reliant on fossil fuels from refineries and while it is recognised that many efficiency improvements to the existing and new fleet are feasible and need to be adopted, the industry consensus is that the middle to longer term requirements of decarbonisation can only be achieved through a switch to low/zero carbon fuels. The critical issue is convincing the IMO, the EU and a very conservative industry that future alternative fuels such as hydrogen and ammonia are not decades away but achievable in the immediate future. These fuels are on the one hand close enough away in industry's mind (2030s) that support for their adoption can safely be used to rule out more immediate measures while being quite far enough away that nothing need happen in the short term. There are a few hydrogen powered ships in operation but these are seen merely as interesting demonstration models. What is needed is an initiative such as the Innovation Fund to kick start the construction of pilot plants, prove to industry that these fuels work and understand better the economics in order to present to policy-makers the needed evidence of feasibility to develop implementing policies.

The fact that ship emissions are totally unregulated only highlights the need for early action to avoid the growth in ship emissions undermining the Paris goals including the hard won emissions reductions in EU road transport. Ideas are circulating at the IMO to establish an R&D fund for technical innovation and new fuels but such a fund will take years to agree and establish. Europe should support such an initiative but in fact as a first mover. The ESSF is about to be refocussed to begin consultation with industry on how to develop alternative fuels for the sector. Even greater care will be needed in shipping than in aviation to ensure the biofuel mistakes of road transport are not repeated for shipping. If biofuels have a quite limited role in aviation, their future in shipping is a great deal less evident because of sustainability concerns and because alternatives exist. The NER400 is up and running and will enable Europe to lead the sector's decarbonisation. A priority for facilitating the development of low carbon or zero emission fuels for shipping should focus on scaling production of renewable hydrogen and ammonia. These investments would also be beneficial for a number of hard to decarbonise industrial sectors.

The shipping industry is fragmented with current policy directed towards a switch to LNG which involves higher capital investment in new ships and very considerable infrastructure costs that may well lead to stranded assets as it is clear that in the longer term LNG is a transition fuel and cannot deliver full decarbonisation. Hydrogen and ammonia are currently considered the most suitable future fuels to deliver full decarbonisation so long as they are synthesized from renewable energy in place of fossil fuels. What is needed are initiatives very similar to aviation; funds to support the building of pilot production plants, onboard testing facilities to convince the industry that these fuels are viable, reliable and climate neutral along with measures to scale up production.

Scaling renewable hydrogen production will have important relevance for electricity sector to balance the grid during intermittent renewable electricity production periods. The availability of hydrogen as an energy carrier will also open the possibility of its use in transport, including shipping.

Scaling of low temperature direct ammonia synthesis with renewable energy or low cost electrolyzers is required in order to develop ammonia with an overall low carbon footprint in terms of the full life cycle analysis of production and use. This development would support the key industries being targeted by the Innovation Fund including the heat generation sector, fuel cells, and renewable energy storage as well as transport including shipping.

Decarbonising shipping needs this sort of a kickstart. Without Europe taking such an initiative and genuinely driving the decarbonisation debate with practical and real world initiatives then we fear the endless circular debates about promoting greater efficiency, carbon pricing and operational practices will continue with little result. If hydrogen and ammonia can be proven to be shipping's future fuels then debate can start proper to focus on what policy measures are needed to deliver the right outcomes. We believe such an outcome is exactly what the EU had in mind when developing the Innovation Fund.

Mandates

Both aviation and shipping will require clear additional policies to bring these fuels to market. One option that should be explored is the development of placing-on-the-market blending mandates to provide refiners with security and to ensure costs are ultimately borne within sector. However to move in this direction first requires certainty that the new fuels are viable, reliable and deliver the sorts of emissions reductions that can lead to decarbonisation.

Supporting documents

- [PtL fuels report by Dr Chris Malins](#) commissioned by T&E - Please note an update will be published on shipping shortly
- [ITF Decarbonising Maritime Transport report](#)
- [Power to Ammonia - Institute of Sustainable Process Technology Report](#)
- [Briefing on Green Hydrogen from the Royal Society of Chemistry](#)

- Electro methane investment study (coming soon)
- T&E Report on LNG in the transport sector including shipping (coming soon)
- T&E Report on investment costs for LNG in the shipping sector (coming soon)
- Shipping Alternatives fuels briefing (will be emailed separately)