Brussels, 30th of March, 2020

Subject: **ART Fuels Forum analysis on the draft result of the LCA study on Determining the Environmental Impacts of Conventional and Alternatively Fuelled Vehicles,** Version 2

The European Commission, Directorate-General for Climate Action, issued a tender for a Pilot Study on Determining the Environmental Impacts of Conventional and Alternatively Fuelled Vehicles through Life Cycle Assessment, which was awarded. The contract was awarded on 27/8/2018 (2018/S 173-391681) to a consortium led by Ricardo Energy and Environment, with the participation of E4TECH and IFEU. The draft results of the study have been presented in a recent workshop in Brussels on 16/01/2020. However, presentations also circulated on-line through Internet by third parties. AFF welcomes open discussion on the subject, which is a necessary phase before drafting the final conclusions and the summary slides.

One of the conclusions (or "Overview of Results") highlighted in the presented draft is that Alternative and Renewable Transport fuels, in contrast to most other studies, have high GHG emission, in many cases these are even higher than fossil fuels (cf. chapter *Results for energy chains – Liquid and gaseous fuels*). The Alternative and Renewable Transport Fuels forum (AFF) does not agree with these draft conclusions.

The public and policymakers are given a negative impression of the climate impact of the use of Alternative and Renewable Transport fuels, even though they are indispensable, with electromobility, to decarbonize transports. Thus, AFF recommends reviewing parts of the analysis and adjust results before the finalization, publication and communication of the study.

In fact, the Alternative and Renewable Transport Fuels forum (AFF) examined the draft results presented during the workshop. It is worth noting that industry had only limited information on the progress of the study, and limited opportunity to provide specific comments. It is our understanding that a target group was consulted but only two broader stakeholder meetings were held in an 18-month period, which did not provide enough time for those outside the target group to provide input. Based on the available information, AFF find that the study has critical elements and elaborated the following AFF main remarks:

- **Fossil and alternative fuels are not compared on equal terms, creating a 20% head-start for fossil fuels.**
- **Current and expected reality in production of alternative renewable fuels should be taken into account with more emphasis.**
- **By focusing on options that with current 'default' performances would not be able to meet future threshold levels the study makes an irrelevant comparison and does not take into account that progress is made on basis of the new design parameters that have been formulated also for RED II.**
- **The role and relevance of the many fuels and energy co-products generated from renewable fuels production and that are dispatchable (and therefore essential to an effective decarbonization of the grid through time) is clearly insufficiently addressed and should be better examined.**
- **The use of counterfactual scenarios, in fact only one scenario, is a questionable methodological approach. Furthermore, it is based on false premises of e.g. no additional feedstock for renewable fuels, or that biomass to electricity (and heat) would be applied without other limits from e.g. economy.**
- **None of the fuels' emissions are measured on a standard methodological basis. Thus, adding ILUC factors to direct emissions that are not counted on the same base is not consistent. Therefore, the analysis would not conform with the International Standard on LCA.**
- **The approach to Soil Organic Carbon (a main UN SDG and EU Green Deal goal) needs to be clarified.**

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- **The comparison of MSW-based processes to other fuels and pathways is not relevant, as MSW is not a feedstock, it has to be processed in one way or the other.**

Indeed, AFF recognizes that the massive breadth of the study makes it difficult to keep the methodology consistent and sound across all different technologies and timelines: however, consistency and soundness depend on the above listed elements. Furthermore, the least known disaggregated elements, e.g. counterfactual emission, have a profound impact on the ranking of the fuels.

In addition, the relevance of Alternative and Renewable Transport fuels (and related value chains) is key not only under the climate goals, but also to achieve the EU Green Deals target and the UN Sustainable Development Goals.

Stakeholders are today expected to quickly and efficiently implement actions to achieve the RED II targets, and the even more ambitious goals set by the EU Green Deal: the results of this study will influence policy development, and further uncertainty will hinder the much-needed investments in the field.

Summarising, **the ART Fuel Forum recommends not to use the study for policy making in the current draft status.**

Detailed AFF comments to the study

The AFF analysis of the draft results from the study have shown that:

The study does not compare fossil and alternative fuels on equal terms, creating a 20% head-start for fossil fuels

- Fossil fuels are assessed by an average/allocation-based approach while alternative fuels are assessed by a marginal/substitution-based approach. Assuming that for simplicity's sake an allocation-based approach is still used for gasoline/diesel, then at least, the marginal (rather than the average) GHG emissions of fossil fuels should be used.
- Carbon footprints of gasoline and diesel are projected to decline steeply from 2020-2050 (file page 51), yet alternative fuels, such as LPG's footprint does not. It would appear here that bioLPG was not considered.
- The Ricardo slides (file page 84) recognise that electricity footprints in certain member states can be significantly higher than the grid average. Yet the report does not recognise this in its results (file page 51) for electric vehicles.

AFF urges the use of marginal fossil emissions to ensure a more balanced comparison. Based on Ecofys (2014), this implies a 20% higher gasoline and diesel benchmark level. Results for electric vehicles should reflect the range of electric footprints in national grids.

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The study, focusing on options that with current 'default' performances would not be able to meet future threshold levels, makes an irrelevant comparison and does not take into account that progress is made on basis of the new design parameters that have also been formulated also for RED II.
'Typical' vales of pathways reflect an assessment (done by EC in consultation with the Stakeholders) of the technical performance of pathways in recent years (and these may have further improved over time, which is not counted in yet) and that 'default' values are then even further conservative values - just meant to allow market players to use them instead if cost-increasing actual value determination. RED II sets higher market entry thresholds and thus the performance of pathways needs to be uplifted to these levels if they still want to be in the market: it seems that the study does not take this into account and thus fails to incorporate existing progress.

AFF urges to reconsider the approach to the study, based on the extensive RED II preparatory work carried out by EC in consultation with all stakeholders on assessing the GHG impact of technological pathways.

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The study does not consider the current and expected reality in production of alternative renewable fuels

- As an example, crop-based European ethanol shows an average (RED certified) GHG emissions figure of 24 g CO2e/MJ without ILUC. That yields 44 g CO2e/MJ if Globiom ILUC is applied, well below the 80-110 g CO2e/MJ (incl. ILUC) in the DG CLIMA Vehicle study.
- The study relies on Globiom results: comparison with other systems (in particular GTAP) has however shown that there were modelling issues with the oilseed chain. GTAP ILUC results ended much lower than Globiom.
- The low emissions from European ethanol are explained by multiple industry initiatives to reduce emissions, such as carbon capture, production of biogas, use of low GHG feedstock, improved energy-efficiency, use of biomass CHP plants. Furthermore, by-products include DDGS which is used for cattle feed and then replaces other fodder protein sources such as e.g. soybeans

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- Similarly, most renewable fuels have pursued and will pursue projects with a low carbon intensity score by design (in the same way that the study assumes that the electricity supply will become greener). Bio-based methanol already today replaces fossil methanol in FAME and could increasingly do so if bio-methanol becomes available.
- ILUC factors that are referenced were modelled in 2014 and were based on the RED I policy, which is no longer appropriate under RED II. So, for example, all of the ILUC factors include indirect palm oil expansion, but now fail to take into account that direct palm oil biofuel for the EU is intended to be phased out. So, in order to include ILUC factors looking forward into a RED II dimension, the factors would need to be updated.
- ILUC assumptions are based on Globiom. However, these ILUC-factors are inherently uncertain. As recognized by the European Commission (Delegated regulation - C(2019)2055) "*the level of ILUC emissions depends on a variety of factors, including the level of additional demand for feedstock triggered by the use of biofuels, and the extent to which land with high-carbon stock is protected worldwide*". The Globiom study assumed a certain demand for conventional biofuels (assumption for 2020 was 8.6% conventional biofuel consumption; while the EC meanwhile put a cap of 7%) - the actual ILUC impact for a type of biofuel is not linear and increases with higher demand. Next to the Globiom modelling, the EC has assessed the actual average expansion area of different types of biofuel crops since 2008 (Annex - C(2019)2055), including expansion into land with high-carbon stock. As a result, only palm oil was the only feedstock to qualify as a 'high-ILUC risk' feedstock. Moreover, improved agricultural management or other policies can have a high impact on ILUC values. Globiom report, pXV: "*If, for example, deforestation and peatland drainage in Indonesia and Malaysia could be avoided by introducing appropriate environmental safeguard systems, LUC emissions for palm oil, soybean oil and other vegetable oils would strongly decrease. These effects should be kept in mind when discussing the emission impacts of current biofuel policy.*"
- Moreover, Adding the results from an attributional and consequential model together is problematic.
- Another example is the study's representation of LPG's carbon footprint. LPG's WTT and WTW 2020 footprints in the study (file page 51) appear to be in contradiction with the Commission's own data: JRC's WTW studies and the Fuel Quality Directive. In addition, the 2050 footprints seem to ignore bioLPG, which enables a 90% carbon reduction and is in the market today.
- TTW emissions are based on theoretical models of fuel consumption, not on plentiful real-world emissions testing conducted or compiled by the Italian research institute Innovhub or Germany's Federal Motor Transport Authority. Real-world emissions are more meaningful than theoretical estimates – this is a given of good LCA practice, as stated in ISO standards for LCA and various other sources. The low emissions from European ethanol are explained by multiple industry initiatives to reduce emissions, such as carbon capture, production of biogas, use of low GHG feedstock, improved energy-efficiency, use of biomass CHP plants.
  TTW emissions are also impacted by the composition chosen for the gasoline and diesel blends. For the gasoline, the study estimates that only 5.6%-6.3% would be non-fossil, mostly from crop-based ethanol. This assumption does not take into account the possibility to introduce better gasoline fuels, such as high octane/oxygenate petrol, as foreseen by the latest Worldwide Fuel Charter: https://www.acea.be/uploads/publications/WWFC_19_gasoline_diesel.pdf .

AFF urges the use of audited industrial and real-world data, especially that from the Commission itself and its member state governments and institutes. Where such data is not used or contradicted, this should be explained. A gradual greening of renewable fuels over time over time should be assumed, as it is for grid electricity. Moreover, it is questionable to just count ILUC factors on top of direct emissions.

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As regards biofuel pathways based on MSW, these seem to have enormous GHG impact, up to 500 gCO2eq/MJ fuel (slide 96). The study claims 'Abnormally high processing emissions for SNG/LSNG MSW due to fossil/biogenic data mashup'. Indeed, part of the MSW is fossil, but the counterfactual is that the MSW is burned (hopefully with energy production, which is usually at rather low efficiency), with the same amount of CO_2 ending up in the atmosphere.

So, it is difficult to understand about the 'high processing emissions' mentioned in the work. Moreover, biofuel pathways can also start from the biogenic fraction of MSW (pre- or post-collection sorted). It seems the study did not consider considered that pathway.
Finally, authors assumed that most of what we consider to be waste is actually fully utilized without providing any support for this position. Some simple potential supply & demand balance analysis should show that is not the case.

AFF urges to reconsider emissions of MSW-based pathways.

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The study does not credit the fact that many energy co-products from renewable fuels are dispatchable (and therefore essential to the otherwise assumed decarbonization of the grid through time).

- Dispatchable electricity based on renewable storable fuels (e.g. biogas, lignin, …) is key to enable the decarbonization of the electricity grid from intermittent/seasonal sources (e.g. wind/solar)
- However, as the grid stabilization role becomes more important, the GHG credit of dispatchable electricity sources declines (since the grid is becoming greener and the credit is based on the average grid)
- Despite the greening of the grid, the marginal electricity used for grid balancing will predominantly be supplied from fossil sources.

AFF recommends addressing this issue by assuming that energy co-products replace the marginal dispatchable electricity sources (typically coal or natural gas) rather than the average grid (this will also ensure a more stable credit to the energy co-product through time)

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- The use of counterfactual scenarios (slide 97-98-99) is based on the incorrect premise of no additional feedstock for renewable fuels. This would also mean that, irrespective of biofuels, no expansion of the use of heat and electricity from biomass beyond the current use would be possible, which is clearly not what energy scenarios are projecting.
- The high counterfactual emissions of syndiesel/syngasoline/LBM from forest residues, agri-residues is highly questionable. Probably the study assumes that practically all carbon of the field residues would remain in the soil. On the contrary, several field tests have shown that most field agri-residues are converted to CO_2 within a few years. Moreover, the reasons why emissions of syngasoline production from SRC are so much lower than from forest residues are unclear.
- It is not correct to assume that all secondary feedstock will come from another existing application. For instance, the International Council on Clean Transportation (ICCT 2014) estimated that Europe has a potential of 220 million tons of waste and residues available for advanced biofuels by 2030 (out of a total pool of 900 million tons). Most of the resources here mentioned do not have a current use. These residues tend to decay on the field/in the forest at rather short-term, with the exception of a small part of Carbon that stays in the soil. So, biogenic emissions are similar in both cases, and there can not be a high penalty in the fuel pathway. Of course, all agree on having a minimum amount of residues let on the field to conserve soil Carbon, but this is just a constraint on the potential of this type of biomass (and is part of sustainability criteria). Alternative fuels producers already are working to develop these waste and residue feedstocks into sources of liquid and gaseous fuels. Hundreds of projects are in development in the EU and around the world.
- As regards anaerobic digestion and biomethane, AFF highlights the following:
  - Process energy (electricity) for Liquefaction of biomethane is in the same order of magnitude as biogas upgrading to biomethane. This is not reflected in the presentation.

  - The reason why processing and transport of agri-residues to biogas should be any higher than for producing biomethane from agri-residues via gasification is completely unexplained, considering that AD has one of the lowest process energy needs of all technologies.
  - There is certainly something wrong in the assumptions when agri-residues for AD display a relatively high counterfactual emission. It has been shown many times that e.g. straw residues from approx. 10 cm high stems (which is never cut with modern harvesters) left on the field together with the roots will guarantee the maintenance of soil organic carbon which is probably the reason for this effect.
  - The fact that digestate adds considerably to the increase of soil carbon has not been considered at all.
  - The tremendous GHG emission is completely out of scope. Source separation of organics from MSW is mandatory according to EU regulation (waste framework directive) and yields one of the lowest GHG emissions when digested. The reason why the non-renewable part of roughly 50% (by energy) of the mixed waste would bring such a high GHG-emission remains totally unclear.
  - The study also lacks in providing the justifications to restrict AD to waste material without taking into account the source separated waste, increasing the potential with additionally grown plants on marginal lands or through additional production (on top of food or feed) or cover (catch) crops.
- In Sweden, already today biomass, mainly forestry by-products and residues, is contributing 25 % of the primary energy used. Estimates indicate that the use sustainable biomass energy could be increased by 50-100 % in the period 2030 to 2045. The left-over slash in the forest is already today larger than the energy use outside of the forest industry and there is also an even larger potential in stumps and roots. In addition, the area-productivity of the forests grows over time, independently of climate change and further enhanced by climate effects generating both more industrial raw materials and associated energy by-products. Furthermore, the felling is only 75 % of the annual growth, such that timber and pulp production could still expand to generate more energy by-products and residues although felling for energy purposes alone are not economically viable.
- The use of this substantial potential would not impact other uses, making the counterfactual scenarios highly problematic.
- As the pool of non-competing feedstock is used, some of the biomass will indeed be taken from existing operations, but that would partly compensate a trend for less biomass combustion as other sources of green electricity take over the market
- In addition to the consideration listed above, well designed and integrated biomass supply chains better using the land and sustainably intensifying agriculture are already in place, and new ones being developed. Some of these sustainable practices are also already recognized by EU as methods to generate feedstocks for Advanced Biofuel production (As per Annex IX Part A of RED II). Industrial projects along this line are already in place in the EU and worldwide, demonstrating the benefit of such approach and contributing to several EU objectives set by other relevant EU policies (EU Green Deal and UN SDGs, Clima, CAP, Waste, etc)
- This also covers the use of vast areas of agricultural land being marginalized in the EU due to the impact of Climate Change (as documented in the EC JRC World Atlas of Desertification and EEA study on farming). Improving the resilience of this land through the adoption of sustainable biomass chains, supporting also food and feed production in well-designed rotation schemes, deserve proper consideration as regards accounting land use change.
- The approach to soil organic carbon (SOC) emission versus increase of SOC needs to be clarified. Why would short rotation coppice have a strong C storage in the feedstock as it is used immediately after cutting to produce energy (in whatever form)? To our knowledge there is no conclusive answer yet on how much carbon is stored in all kind of forestry even though a large number of studies and IEA Bioenergy publications are available. However, they all show that independent of the method (SRF or classical forestry with gasification, etc.) the carbon balance is more or less neutral or positive.

AFF urges not to add a counterfactual in the coming 2 decades (as resources are available) and to only start accounting for the counterfactual if resources are not being naturally liberated by the greening of the grid.
Also, the approach to Soil Organic Carbon (a main UN SDG and EU Green Deal goal) needs to be clarified.

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Finally, the comparison of the use of MSW to produced biofuels with other fuels and pathways is not relevant. Only post-recycling biogenic wastes and not MSW should be considered for such processing in the first place. Secondly, wastes in various forms needs to be handled in one way or the other if not society should drown in leftovers, so there is no choice. Therefore, the relevant basis for comparison is the consequences of various methods to manage post-recycling wastes such as disposal of wastes, e.g. in landfills, energy recovery as power and heat or material recovery as fuels and chemicals. Although such methods may have worse environmental consequences than other fuels, the management of the quantities and qualities of non-recyclable wastes generated in society should be made with the goal to minimise its environmental impact. Furthermore, even if waste quantities are large, nevertheless the quantities are in energy terms small in relation to the quantities of fuels used in transport.

AFF suggests that waste-based fuels are not compared with other fuels and pathways, but rather compared with their own set of realistic and more or less desirable options. In addition, with an increased greening of the grid, it can be assumed that the use for fuels will increasingly beneficial as the fossil use in the transport system lags behind other sectors.

The ART Fuel Forum

The ART Fuels Forum (artfuelsforum.eu) brings together ca. 100 experts and leaders representing the value chain for alternative transportation fuels to facilitate discussions, elaborate common positions on policy issues and identify market penetration opportunities and barriers for these fuels. The Forum is established and financed by the European Commission under the project name "Support for alternative and renewable liquid and gaseous fuels forum (policy and market issues)". It is composed of stakeholders from the European Alternative and Renewable Transport Fuels (ART Fuels) production industry, the transportation sector, the main international cooperation actors and EU policy makers and stakeholders.

ART Fuels Forum focuses on sustainable advanced liquid and gaseous transportation fuels derived from a broad range of non-food feedstocks using specialized conversion technologies. These transportation fuels include, among others, fuels produced from thermochemical and biochemical conversion of lignocellulosic biomass, fuels from algae and microbial biomasses, power to gas/liquid fuels, solar fuels, fuels from industrial waste gases, fuels from municipal solid waste, plastic waste and refinery waste, and co-processing of biomass intermediates in existing refineries.

DISCLAIMER - The above statement has been prepared by the Alternative & Renewable Transport Fuels Forum (ART Fuels Forum) after exchange of opinions and internal consultation among the Forum members. The content of the contribution does not necessarily reflect the views of all members of the ART Fuels Forum but is a synthesis of the main positions. The positions and recommendations listed above are those of the members of the ART Fuels Forum and do not necessarily reflect either the official position of the Commission or the complete position of the members of the ART Fuels Forum.