

A true comparison of the GHG reduction potential of transport energy sources and the concept of Total Emissions of Ownership

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Our Abstract:

More governments and companies are setting climate targets. The end goal is zero-emission transport for all road transport, and in this transition phase road freight transportation using low emission fuels is an important part of an effective strategy in the transition to net zero emissions. A wide variety of potential transition fuels exists and there is a general consensus that there will not be a single low carbon fuel solution or energy source that fits all transport needs in the foreseeable future. It is also anticipated that renewable liquid and gaseous fuels will have a transitional role in certain market segments for some time to come.

Through a review of several reports¹ on greenhouse gas (GHG) emission factors it was concluded that the actual GHG reduction potential of zero emission and low emission fuels varies significantly when (i) considering the source of production or the feedstock used – for instance, in the case of biofuels the distinction can be made between crop-based feedstock and waste-based feedstock to produce the fuel, whilst for synfuels and e-Fuels the carbon content of the electricity used largely determines the actual emission factors and therefore the GHG emission reduction potential; (ii) considering that the reviewed reports did not cover methane slip for the gaseous vehicles which can be a strong greenhouse gas contributor, (iii) the direct and indirect contribution to land use change for crop-based fuels can be significant and should be considered when selecting the specific feedstock for the production of the fuel, (iv) certain fuel development scenarios include Carbon Capture Utilization and Storage (CCU/CCS) in the production pathway as a method to reduce life cycle emissions.

From a methodological point of establishing emission factors for calculating and reporting of GHG emissions, our review highlighted the following challenges: (i) the methodology to calculate and attribute the effects of indirect land use change, which can be substantial, change to the emission factor is still under development; and (ii) once a fuel sees substantial share of the market, there is a need to switch from a consequential approach, which relies on marginal accounting techniques and can lead to negative emission factors, to an attributional approach which is recognized as being better for producing emission inventories. For calculating and

¹ The sources covered are: JEC WTW study v5, published October 2020, EU Renewable Energy Directive (RED II), UK BEIS (formerly Defra) 2020 data and the Dutch CO₂emissiefactoren.

reporting on the new fuels, it is therefore important to understand and certify the source and the lifecycle GHG emissions of the fuels using neutral, well-established mechanisms such as Roundtable on Sustainable Biomaterials (RSB) and International Sustainability & Carbon Certification (ISCC), whilst in the absence of a fuel certificate, cautious conservative 'default' values for calculating and reporting should be proposed to avoid overestimating GHG emission reduction potential.

From a pragmatic point of view, these findings pose new challenges and need to be reflected in decisions taken by Governments, shippers, carriers and others investing in the new propulsion technologies. Therefore, our work is developing the Total Emissions of Ownership (TEO) concept, in line with industry approach to use Total Cost of Ownership as a decision making method, to help guide organizations which fuel, feedstock and technology to consider and reflect the true GHG emission reduction potential of the various propulsion technologies. The TEO concept enables comparison between fuels, feedstocks, propulsion technologies and considers the operational upstream and downstream emissions as well as future emission profiles. The aim is to go beyond using the emission factor values for fuels at the time of purchase of a vehicle, and instead provide a harmonized framework by which the likely trends in emission profiles over the course of a vehicle's lifetime can be considered in advance.

Our research was partially financed by the Dutch Enterprise Agency (Rijksdienst voor Ondernemend Nederland) and is carried out in collaboration with the European Technology Platform ALICE.

Smart Freight Centre (SFC) is the lead author of the Global Logistics Emission Council, establishing a default methodology and industry standard for calculating and reporting of logistics GHG emissions. SFC is a global non-profit organization dedicated to an efficient and zero emission freight sector.