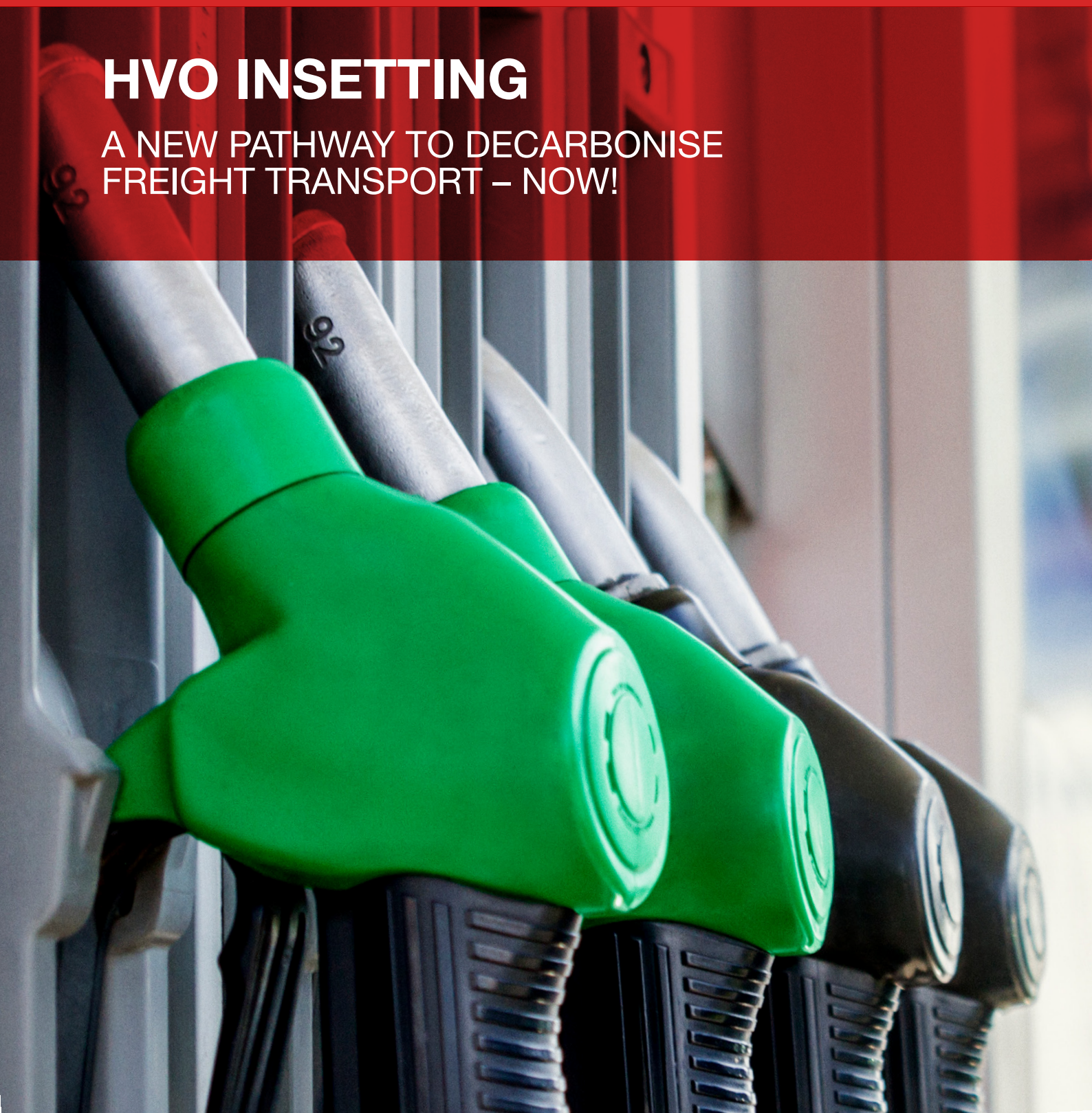
EXPERT PAPER

HVO INSETTING

A NEW PATHWAY TO DECARBONISE FREIGHT TRANSPORT – NOW!



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EXECUTIVE SUMMARY

Today, freight transport is responsible for 8% of the global CO_2 emissions. Decarbonising the sector is an immense challenge, as - in contrast to most other sectors - its emissions are still increasing. Under a business as usual scenario, they are expected to double due to growing global freight demand. To meet this challenge, a multi-tiered approach is indispensable.

The roadmap toward decarbonisation can be subdivided into four actions: Avoid, Shift, Improve and Inset. This last one is a recent addition to the well known triplet. Carbon insetting is an innovative mechanism for companies to reduce carbon emissions by investing in interventions within their own value chain. It focuses on avoiding and/or reducing emissions in for example their supply chain. This approach is considered much more effective than carbon offsetting. Although offsetting has a positive impact on the climate, it doesn't reduce the transport sector's carbon footprint.

Insetting opens a new and very promising pathway as new technology (electric trucks, hydrogen, etc.) is still under development or almost unavailable. One of the most promising fuels available already today is HVO, a second generation biofuel that is highly sustainable, since it is made primarily from waste and residues. It is a drop-in fuel and can thus replace diesel without any adaptation to the truck.

A slight disadvantage of HVO lies in a demand that rises more rapidly than the ramping up of the production capacity. As a result, availability is limited at public filling stations. Insetting, however, is an excellent method to tackle this relative scarcity.

In the HVO insetting concept, this biofuel is used effectively or accounted for via the 'mass balance' method throughout the supply chain. A company aiming to reduce partially or totally the CO_2 emissions of its supply chain requires the hauling company to use HVO. When conventional diesel has to be used for practical or operational reasons, this volume is then compensated through insetting. In other words: thanks to the mass balance approach, the transports are decarbonised by direct allocation of HVO transports in the hauliers' network.

HVO Insetting requires a transparent and reliable method to calculate the volumes of HVO used for the insetting client and to monitor the contractual insetting commitments. This transparency can be guaranteed by an independent accounting firm using an extensive reporting and auditing methodology.

DECARBONISING FREIGHT TRANSPORT, AN IMMENSE CHALLENGE

The Paris Agreement sets ambitious climate targets. As more and more governments, associations and businesses take action to address them, few sectors can make as much of an impact as freight transport and logistics. According to the International Transport Forum (ITF), this sector contributes 8% of global CO_2 emissions and as much as 11% if logistics sites and ports are also considered. Road constitutes 62% of freight transport emissions (50% non-urban, 12% urban), while sea contributes 27%, air 6%, rail 3% and inland waterways 2% .

In its European Green Deal, the European Commission set the ambition for Europe to be the first climate-neutral continent in the world by 2050. This should be achieved in two steps. The first one is to reduce CO_2 emissions by 50%, if not 55% by no later than 2030. The second aims to reach zero emissions by 2050.

The challenge for freight transport is immense: the sector is considered to be one of the most difficult to decarbonise: in contrast to most other sectors, its emissions are still increasing. Under a business as usual scenario, global transport demand is estimated to triple by 2050, which would mean doubling carbon emissions. Decarbonising this sector by 2050 will thus take both extraordinary ambition as well as global, coordinated action.

Within the current growth paradigm, the decarbonisation of transport faces many obstacles. If we are to meet climate goals and maintain our standard of living, freight transport and logistics will have to undergo a deep transformation. As technological progress alone will not be sufficient to achieve decarbonisation, the sector will have to adopt a multi-tiered approach.

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AVOID, SHIFT, IMPROVE AND INSET

The Alliance for Logistic Innovation and Collaboration in Europe (ALICE) is aware of the huge challenges and deep transformation required of freight transport and logistics if we are to meet climate goals and maintain our standard of living. That is why ALICE developed a roadmap entitled “Towards Zero Emissions Logistics 2050” to set the challenge and direction clearly. This roadmap makes it easier for companies to proactively respond to the Green Deal’s transport targets by developing their own company roadmap.

As the deployment of greener vehicles and other technologies for a more efficient transport network is forecasted to be too slow, the short-term focus of the ALICE roadmap is on leveraging and finding new opportunities for efficiency gains in freight transport and logistics. By doing more with less and by creating value through efficiency gains, it will be possible to speed up the transition to greener and cleaner assets.

FREIGHT DEMAND GROWTH IS MANAGED	TRANSPORT MODES ARE SMARTLY USED AND COMBINED	FLEETS AND ASSETS ARE SHARED AND USED TO THE MAX	FLEETS AND ASSETS ARE ENERGY EFFICIENT	FLEETS AND ASSETS USE LOWEST EMISSIONS ENERGY SOURCE FEASIBLE
• Supply chain restructuring • Localization and nearshoring • Decentralization of production and stockholding • 3D printing • Dematerialization • Consumer be-haviour	• Increase use of rail • increase use of short sea shipping and inland waterways • Modular road transport • Cargo bikes • Multi-modal optimization • Synchromodality	• Load optimization • Load optimization and asset sharing • Reduce empty moves • Modular packaging and boxes • Open transport networks and warehouses • Increase storage desnity and energy efficiency	• Cleaner and efficient technologies • Efficient vehicles and vessels • High capacity vehicles / duo trailers • Driving behaviour • Fleet operation • Fleet maintenance	• Electric / hybrids • Solar / wind • Biofuels • Hydrogen • CNG / bio-LNG • Cleaner diesel • Fuel management

The ALICE roadmap toward decarbonisation of freight transport is a holistic approach entailing various solutions. In order to put them into practice, they need to be translated into a number of actions. These can be subdivided into four actions: **Avoid, Shift, Improve and Inset**. This last one is a recent addition to the well known ‘Avoid-Shift-Improve’ triplet. As we will see, ‘Insetting’ opens a new and very promising pathway to decarbonise the global freight transport.

AVOID

Avoid refers to the need to reduce the total amount of transport and optimise the efficiency of the transport system. Avoiding unnecessary movements or trips can be done through the use of smart routing tools, bundling of loads, optimised crossdocking, reducing trip length, etc. The aim is to use all the assets as efficiently as possible. Emissions can also be avoided by investing in driver training for energy-efficient driving to lower fuel consumption.

SHIFT

Shift is intended to improve the energy efficiency in the transport system by opting for more sustainable, less carbon-intensive and shared modes. It implies a modal shift from the most energy consuming transport modes (trucks and planes) towards modes like inland waterways and train. This shift reduces specific energy consumption – and thus CO_2 emissions - per tonkm. Shifting to more sustainable transport modes is not only more energy-efficient, it also takes trucks off the road. It is therefore also a solution to road congestion and reduces the pressure on the driver shortage. Shift is an essential solution for transport, also in the long term.

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IMPROVE

Improve the environmental performance of transport means. This component focuses on technological progress, vehicle and fuel efficiency as well as on the use of alternative energy sources. This point implies the use of the most efficient and least consuming diesel trucks available on the market and the optimising of vehicle design (aerodynamics, for example). This will not be sufficient though, as diesel is a fossil fuel. Alternative (bio) fuels and drive lines (electric trucks) will be needed. Today, however, these technologies are either insufficiently available on the market for the various use cases or still in development. Also, the necessary infrastructure to produce and distribute the green energy is still lacking today. In that respect, improving the energy efficiency of the present transport modes remains the most important game changer.

INSET

Inset. Carbon insetting is a recent but emerging mechanism for companies to reduce carbon emissions by investing in interventions within their own value chain. Insetting focuses on avoiding and/or reducing emissions in upstream or down-stream operations (i.e. their supply chain). This method is considered much more effective than carbon offsetting (a reduction or removal of CO_2- by compensating them elsewhere, for example by planting trees and reforestation initiatives). Although offsetting has a positive impact on the climate, it doesn't reduce the transport sector's carbon footprint (see further).

THE CHALLENGES FOR ALTERNATIVE TRUCKS AND FUELS

The various stakeholders are investing massively in new technologies, means of transport and energy sources. These are gradually coming onto the market. However, it must be said that the expectations of the general public (and politicians) today are sometimes too high. For example, there is a perception that all types of electric trucks and alternative fuels such as hydrogen can be deployed today. This is far from being the case, at least on a large scale.

There is no single solution for sustainable transport in the future of mobility and all main alternative options must be pursued, with a focus on the needs of each transport type.

Battery electric trucks (BEVs) start to appear on the market, but their range limits them to urban and peri-urban transport. Their production figures are also too limited and the battery charging infrastructure is presently way too scarce. Their price is still prohibitive (they are roughly three times more expensive than diesel trucks). Also, the expansion of BEVs is limited by the availability of strategic minerals needed for the batteries.

Fuel cell electric trucks (FECVs) have a longer range, but they won't be on the market on a large scale before the second half of this decennium. In order to be sustainable, they need 'green' hydrogen, which will be almost unavailable in the short and medium term in sufficient amounts. The filling infrastructure is also embryonic. Therefore, it will take several years before FCEV's can be on the roads in large numbers.

In a transition period, hauliers will have to turn to different fuels as an alternative to diesel.

Liquefied Natural Gas (**LNG**) is presently the most popular one. Trucks on LNG emit up to 20% less CO_2 compared to diesel (tank to wheel) but their well to tank performance is controversial, since methane is an aggressive greenhouse gas (GHG). On top of that, LNG still is a fossil fuel. LNG trucks, therefore, are considered being in a dead end street.

An valid alternative for LNG is **bio-LNG**, which is highly sustainable: it is a 100% biofuel derived from renewable resources such as animal manure, sewage sludge or green waste. Bio-LNG reduces CO_2 emissions by 90%. This fuel can be used in LNG trucks without adaptations and it can benefit from the growing LNG filling infrastructure. However, there is no significant Bio-LNG production capacity available as it is still a highly evolving technology. It is also more expensive to produce than LNG, though the production costs differ strongly depending on the feedstock. This solution thus will remain marginal, even in the medium term.

In the short term, second generation biodiesels like Hydrotreated Vegetable Oil (HVO) are widely seen as the most promising transition fuels. **HVO** is a biofuel made primarily from waste and residues and thus considered as highly sustainable.

Fatty Acid Methyl Ester (**FAME**), a first generation biodiesel, was originally considered as a promising transition fuel, but it lost momentum since it is produced to a large extent from edible oils, which makes it less sustainable. (see Box)

THREE GENERATIONS OF BIOFUELS

First generation biofuels are produced are derived from vegetable oil, starch, or sucrose. They are are produced directly from food crops such as corn, wheat, sugar cane, sugar beet and rapeseed. These biofuels are made through fermentation or chemical processes that convert the oils, sugars, and starches into liquid fuels. In addition to environmental concerns, there is considerable concern that first-generation biofuels could impact global food production.

Second generation biofuels, also known as ‘advanced biofuels’, are produced from non-food biomass, such as perennial grass, fast-growing trees and to a growing extent by-products and waste (e.g., corn stover, wheat straw, forest residue, municipal waste, used cooking oil, slaughterhouse waste, etc.).

Third generation biofuels, are made from microscopic algae. They are even more sustainable than second generation biofuels, but are still in an experimental phase. Oil producing algae grow quickly. However, controlling the environment for optimal growth is challenging and expensive. The cost of algae-based biofuel is today much higher than fuel from other sources.

WHY IS HVO THE BEST ALTERNATIVE ON THE MARKET TODAY?

Hydrotreated Vegetable Oil (HVO) is a second generation biodiesel: it is made from (even low quality) waste products, residues and fats from the food industry (not from food crops such as rapeseed or palm oil). It is now the most sustainable diesel fuel on the market, with up to 90% less CO_2 'well to wheel' (WTW) emissions and 100% lower 100% 'tank to wheel' emissions (TTW). Simultaneously it lowers significantly local tailpipe emissions, such as nitrogen oxides (-9%) and fine particulate matter (-30%).

Waste-derived HVO is an immediate and easily deployable alternative, which can already make an impact today. It has become a viable choice to help reduce diesel vehicle emissions as it has the lowest amount of greenhouse gas emissions.

An important advantage of HVO is that it is a so-called 'drop-in' product. It can be used in almost any modern truck without any modifications to the diesel engine. An additional advantage is that HVO can be used pure or in a mixture with fossil diesel. Most truck manufacturers have already approved the use of HVO in their diesel engines.

The HVO diesel price is higher compared to fossil diesel. Compared to other sustainable fuels however, it is actually much cheaper as there is no need to modify existing equipment, being the trucks or the filling infrastructure.

A slight disadvantage of HVO lies in a demand that rises more rapidly than the ramping up of the production capacity. Indeed, one of the biggest challenges for this technology is to continue to find sufficient feedstocks to meet the rising demand. As a result, availability is limited at public filling stations in Europe.

Insetting, however, is an excellent method to tackle this relative scarcity at public service stations.

> Waste-derived HVO is an immediate and easily deployable alternative, which can already make an impact today.

WTW = WTT + TTW

The term Tank-to-Wheel (TTW) refers to a subrange in the energy chain of a vehicle that extends from the point at which energy is absorbed (charging point; fuel pump) to discharge (being on the move). TTW thus describes the use of fuel in the vehicle and emissions during driving, while the term Well-to-Tank (WTT) describes the subrange of fuel supply ¬– from production of the energy source (petrol, diesel, electricity, natural gas) to fuel supply (transport to the charging point or fuel pump). In the era of e-mobility and decarbonization, a holistic approach is increasingly favoured which covers the entire energy consumption and all greenhouse gas emissions of a fuel caused by production, supply and use. The generic term that subsumes Tank-to-Wheel and Well-to-Tank is Well-to-Wheel (WTW). (Source: Smart Freight Center)

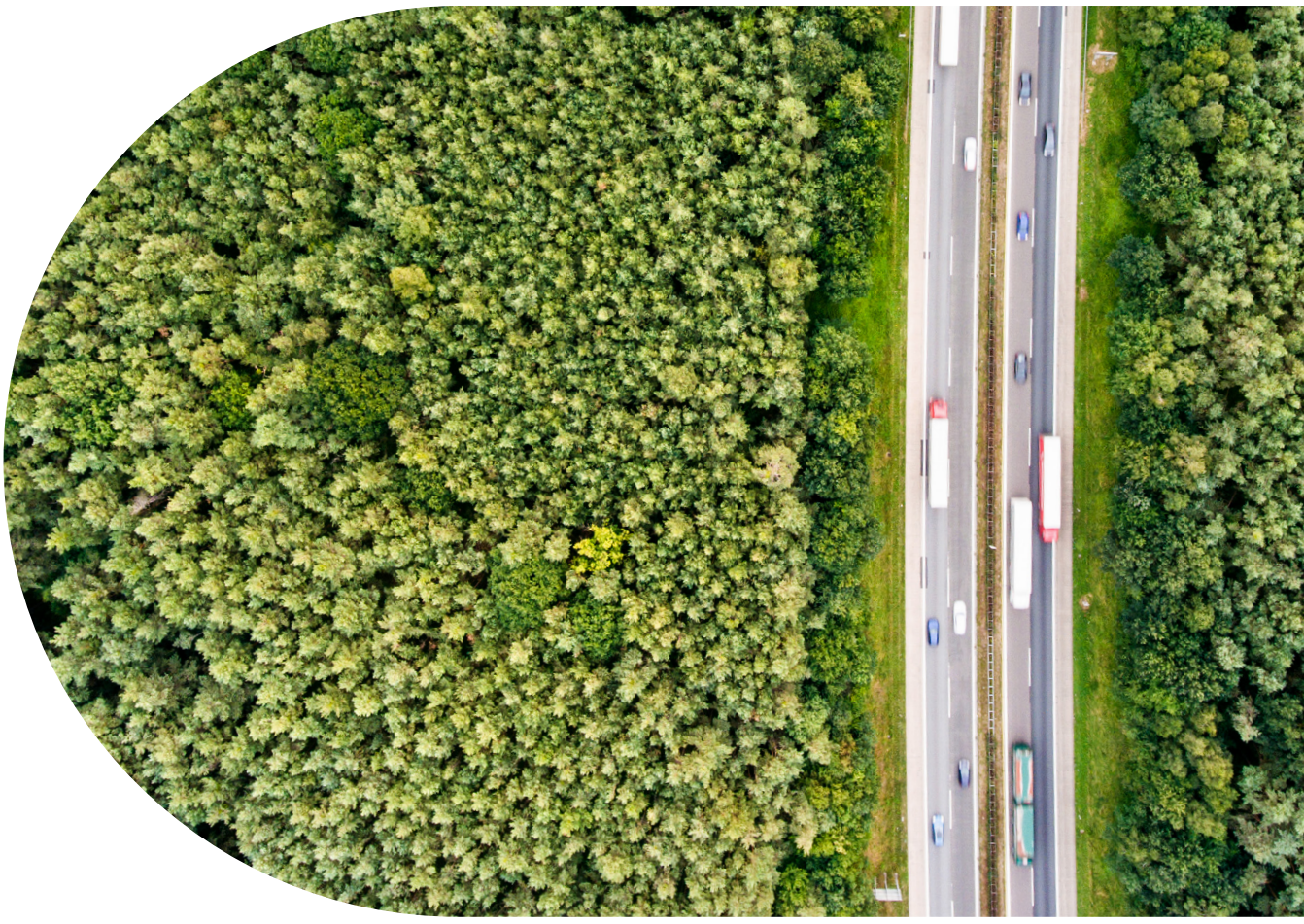
WHAT IS INSETTING AND HOW DOES IT DIFFER FROM CARBON OFFSETTING?

The pressure on organisations to lower their emissions or to become ‘Net Zero’ is growing. Today, one of the methods of achieving these goals is **carbon offsetting**. This is a reduction or removal of emissions of carbon dioxide and other greenhouse gases by compensating them elsewhere, for example by planting trees and initiating reforestation.

While carbon offsetting typically involves payments to projects (via third party offset providers) that capture or sequester carbon dioxide elsewhere, **carbon insetting** is an emerging mechanism for companies to reduce carbon emissions by investing in interventions within their own value chain and to truly change the way they do business.

Carbon insetting focuses on avoiding or reducing emissions in a company’s upstream or downstream operations. This approach is designed to help it reach its sustainability goals internally and to encourage engagement within its own ecosystem. By committing to insetting, a company invests in making its own products, practices and supply chains more sustainable.

With carbon offsetting, companies release financial resources for decarbonisation, which is praiseworthy. However, this method offers little incentive for companies to reduce their own dependence on fossil fuels and to lower emissions in their own operations and supply chains. Although offsetting can be used as a last resort or solution when it is difficult or impossible to decarbonise operations, it can turn into an easy fix offering peace of mind.



SCOPE 3 EMISSIONS

Insetting interventions address the so called Scope 3 emissions (see box) within the value chain. These are the emissions that a company doesn't directly generate itself but are caused by its business activities, including its supply chain.

In many cases, Scope 3 emissions account for the majority of a company's carbon footprint. Studies have shown that these emissions account for most reporting gaps. Hence a correct and precise methodology to account for and report emissions is a must.

Greenhouse Gas (GHG) Protocol supplies the world's most widely used greenhouse gas accounting standards. It stablished comprehensive global standardized frameworks to measure and manage emissions from private and public sector operations, value chains and mitigation actions.

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SCOPE 1, 2 AND 3 EMISSIONS

GHG Protocol provides standards, guidance and tools for companies and governments to measure and manage climate-warming emissions. It distinguishes three categories of emissions:

Scope 1 covers GHG emissions that a company makes directly trough its owned and controlled resources (plants, boilers, vehicles, etc.)

Scope 2 emissions are indirect emissions from the generation of purchased energy produced on its behalf by an utility provider (electricity, steam, heat and cooling).

Scope 3 covers all indirect emissions (not included in Scope 2) generated in the value chain of the company. These are linked to its operations, including both upstream and downstream emissions. In other words: all emissions from raw material extraction to the use of the end product.

WHAT IS HVO INSETTING? HOW DOES IT WORK?

As mentioned earlier, HVO is still only available in a limited number of public service stations in Europe. Transport companies, however, can buy HVO for their own use in their own filling stations. Using HVO along their total supply chain is nevertheless problematic: trucks are inherently nomadic and are therefore not always able to refill their tanks with HVO en route. In many cases, they have to fill their tanks with conventional diesel. This led to the creation of the HVO insetting concept, in which HVO is accounted for throughout the supply chain via the so-called 'mass balance' methodology.

In this scheme, a company aiming to reduce partially or totally the CO_2 emissions of its supply chain requires the hauling company to use HVO in the transport it orders. When conventional diesel has to be used for practical or operational reasons, this volume is then compensated through insetting.

How does it work in practice? For each transport order, the amount of fossil diesel consumed is transparently calculated. That volume is then compensated internally by the transport company with transports where HVO diesel is used. Thanks to the 'mass balance' principle, the transports of the insetting customer are decarbonised by direct allocation of HVO transports in the hauliers' network.

The insetting concept implies a contractual engagement between the company wanting to reduce its carbon emissions of its transports through the use of HVO and the hauling company that executes the transports. Mass balance allows the company to opt for a total or partial decarbonisation of its transports. These volumes can also be varied for each individual route.

To ensure the integrity of the whole process and the actual achievement of emission reductions, a fully transparent and reliable method is required to calculate the volumes of HVO used and to monitor the contractual insetting commitments. This external control can be done by an independent accounting firm conducting assurance audits.

> Thanks to the 'mass balance' principle, the transports of the insetting customer are decarbonised by direct allocation of HVO transports in the hauliers' network.

THE MASS BALANCE APPROACH

The 'mass balance' approach is a way to neutralize emissions by replacing conventional fuel with more sustainable fuel regardless of the place of use. When CO_2 is released from a fossil fuel source, it adds to the overall CO_2 mass in the atmosphere. It is irrelevant whether that CO_2 is released in Belgium or Spain. By the same logic, it makes no difference where CO_2 additions are avoided. Through the mass balance principle, CO_2 emissions from fossil fuels are compensated (neutralized) by reductions elsewhere.

The principle is similar to the distribution of 'green' electricity. Although consumers cannot be certain that the electricity they buy and use in their homes directly comes from renewable sources, they have the assurance that the overall share of green energy is available in the grid.

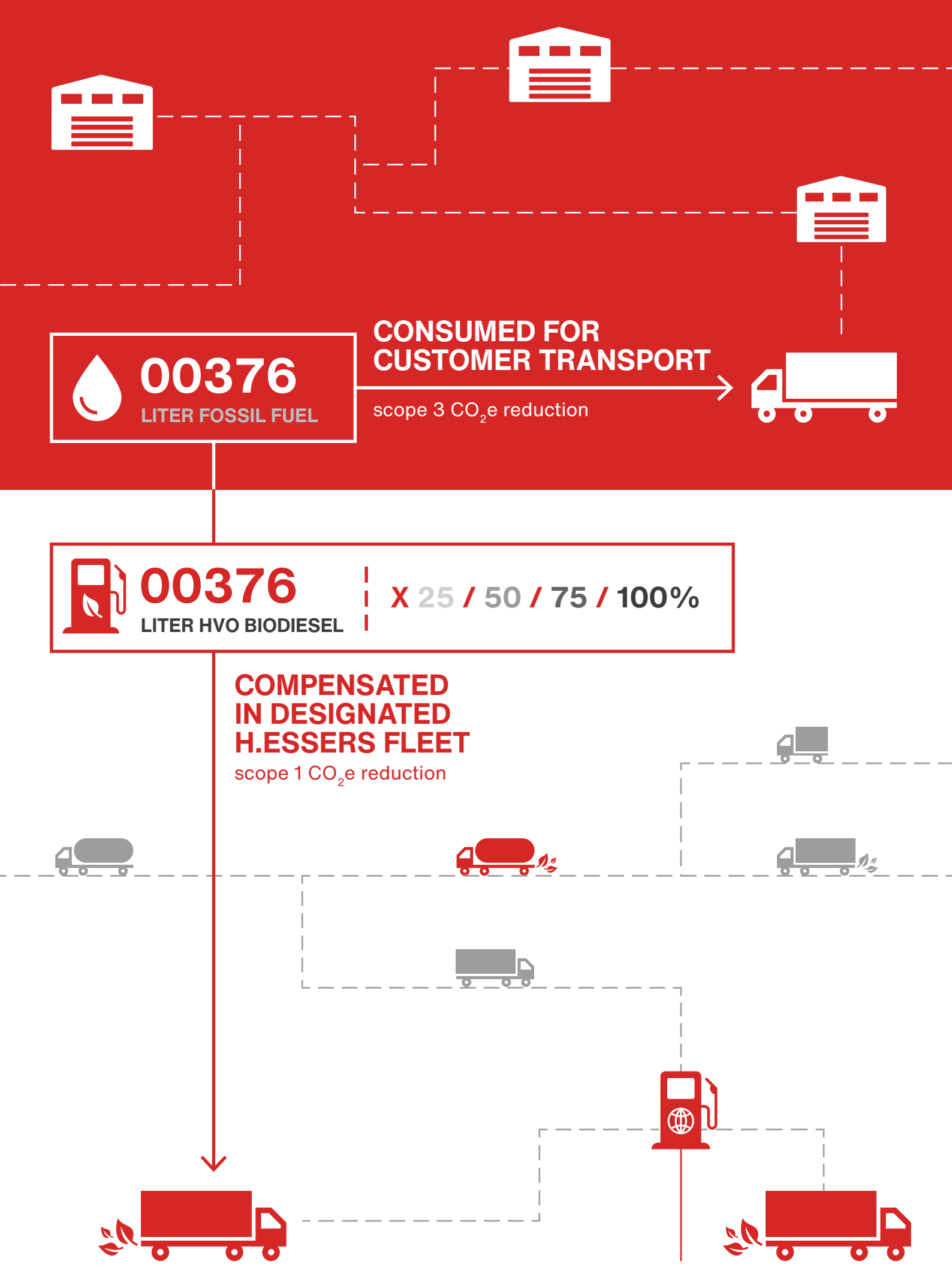

illustration of the volume-based mass balancing concept as supplied by H.Essers

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This article is initiated by H.Essers.

ABOUT H.ESSERS

The H.Essers company was founded in 1928 by Henri Essers and has since become one of the leading companies in Europe for logistics services for sectors such as chemicals, pharma, infra and parts. In recent years, the company has experienced solid expansion thanks to organic growth and a number of strategic acquisitions. In 2021, H.Essers booked an annual turnover of EUR 925 million*. The company currently has 1,350,000 m² of warehouse space, a fleet of 1.440 trucks, 3.816 trailers, 480 Safeboxes and 2100 ISO tanks. Over 50% of this fleet is multimodal. 7.500 people work at H.Essers, in 89 locations and 19 countries worldwide.

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