



HYDROGEN EUROPE'S POSITION PAPER ON THE SUSTAINABLE AND SMART MOBILITY STRATEGY

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CONTENTS

2 Executive summary

3 Chapter 1: Hydrogen momentum

3 At the European level

3 At the national and regional level

4 Hydrogen: paving the way for the decarbonisation of the mobility sector

5 Chapter 2: A four-dimensional approach

5 Supply of hydrogen-powered vehicles

9 Hydrogen distribution and infrastructure

11 Demand - ensure a just transition

12 Supply of hydrogen as a fuel

15 Chapter 3: Financial instruments

17 Chapter 4: Digitalisation will need hydrogen

18 Chapter 5: Illustrative examples





EXECUTIVE SUMMARY

- Hydrogen Europe welcomes the forthcoming **Sustainable and Smart Mobility Strategy as the roadmap** outlining the vision and measures to decarbonise the transport sector and meet the objectives of the Green Deal. **Hydrogen mobility will play a role in all transport applications, especially in sectors that cannot be easily electrified, such as heavy-duty, air and maritime transport.** Some applications are fully deployed (e.g. buses, passenger cars, and captive fleets such as taxis), while others are in development. Up to 10,000 hydrogen-powered trucks are expected by 2025 and up to 100,000 by 2030 on European roads. After 2030, the maritime and aviation sectors will take off, but preparations start now.
- **Keeping and developing European industrial leadership** in the hydrogen transport sector will be essential to maintain jobs and generate growth across Europe.
- An **overarching ecosystem approach is essential**, starting with **hydrogen hubs or valleys** to boost hydrogen mobility by leveraging economies of scale in strategic locations such as ports and airports. The transport sector will require large amounts of clean hydrogen and **act as an enabler of clean hydrogen ecosystems.**
- Complementary **cross-sectoral policies** and **financial measures are needed to accelerate the demand and supply of clean hydrogen as a fuel, the supply of hydrogen-powered vehicles, and to provide the necessary infrastructure and incentives** to buy hydrogen-powered vehicles.
- The **CO2 content of energy carriers should become the “new currency”** of the energy system, with a transparent mechanism for tracing and tracking the carbon content.
- There are EU regulations that support the adoption of low-carbon, zero-emission vehicles, but **some pieces of legislation can act as a barrier.** Therefore, **they should be revised**, and the **transitional role of hydrogen-based fuels should be considered.** In the maritime and aviation sectors, hydrogen-based fuels such as **synthetic kerosene for aviation and ammonia for maritime transport** will play a key role.
- By using **existing gas grids**, the industry is preparing to **supply clean hydrogen at affordable prices** in large quantities and to **support the development of an extensive network of hydrogen refuelling stations.** To strengthen this process, the TEN-T and TEN-E synergies must be enhanced. The **Scandinavian-Mediterranean corridor** is an example of how this could be done: 40,000 hydrogen-powered trucks would require 218 HRS by 2030 and save 4.6 Mt of CO2 annually.
- **The AFID review will play a central role following an ambitious review process.** It is expected that 1,500 HRS will be needed in the heavy-duty sector by 2030.
- **Regulatory policies** at the European level are needed to enable hydrogen mobility, such as the Energy Taxation Directive or the Taxonomy Regulation.
- **Investment in the use of clean hydrogen as a fuel is a crucial driver to ensure the competitiveness of clean hydrogen** in gaseous or liquid form to decarbonise the mobility sector. EU standards and regulations are required to support the use of clean hydrogen and hydrogen-based fuels, including an **ambitious review of the Renewable Energy Directive.**
- **Strong coordination of financial instruments** at European, national, and regional level will be necessary to make the best use of available resources. The **European Clean Hydrogen Alliance** will play an important role in bringing together the entire value chain to realise ambitious projects that will be implemented notably through the Important Projects of Common European Interests (IPCEI).

CHAPTER 1

HYDROGEN MOMENTUM

At the European level

The Sustainable and Smart Mobility Strategy (SSMS) that the European Commission is planning to unveil on 9 December 2020 will map the vision and measures needed for decarbonising the transport sector. Greenhouse gases (GHG) emissions are rising in this sector, while traffic is expected to grow. In addition, the transport sector faces the **specific challenge to tackle GHG emissions from hard to abate sectors which cannot be easily electrified**, such as heavy-duty transport, aviation, and maritime.

For this to happen, **the industry needs clear goals and predictable policies** to provide a business case for investment. A broad coalition of stakeholders is needed to identify and enable decarbonisation pathways to achieve a net-zero emissions future. Any policy framework will need to consist of **a set of complementary cross-sectoral measures to accelerate demand and supply of clean hydrogen and hydrogen-powered vehicles, provide the necessary infrastructure, and incentivise customer behaviours.**

The **SSMS is a unique opportunity to illustrate how hydrogen technologies can support**, in a cost-effective manner, the **achievements of the Green Deal ambitions** to reach carbon neutrality by 2050. The SSMS is expected to “*Propose measures to facilitate the use of hydrogen and its derivatives in the transport sector in the Commission’s upcoming Sustainable and Smart Mobility Strategy*” as stated in the **EU Hydrogen Strategy**[1].

The EU Hydrogen Strategy foresees renewable hydrogen targets of 6 GW (or 1 million ton of hydrogen) by 2024 and 40 GW (or 10 million ton of hydrogen) by 2030. **The transport sector will require large amounts of clean hydrogen and can, therefore, act as an enabler for a clean hydrogen ecosystem.** For example, 10,000 hydrogen-powered trucks would need as much as 100,000 tonnes of hydrogen annually[2].

At the national and regional level

Hydrogen ambitions are also shown by the number of **national hydrogen strategies**[3] released or planned: e.g. 16 billion € investment in hydrogen technologies by 2030 are foreseen in France and Germany. The French hydrogen strategy plans 20,000-50,000 light-duty vehicles, 800-2,000 heavy-duty vehicles and between 400-1,000 hydrogen refuelling stations by 2028. Another example is the Dutch strategy which forecasts a 300,000 light-duty vehicles fleet as well as a minimum blending rate of 14% of sustainable aviation fuel (SAF) by 2030. The importance of hydrogen mobility is also highlighted in the **National Energy and Climate Plans**[4] (NECPs). 25 Member States specifically mention hydrogen mobility applications with diverse levels of details. Czechia, for example, foresees the deployment of between 40,000 and 50,000 fuel cell electric vehicles (FCEVs) by 2030. **European regions** are also leading the way, including via the European Hydrogen Valleys Partnership[5]. To highlight one example, the roadmap of the region of North-Rhine-Westphalia foresees a minimum of 400 hydrogen-powered trucks and 500 buses by 2025 and a minimum of 20 hydrogen refuelling stations (HRS) for heavy-duty applications.

[1] COM (2020) 301 final: a hydrogen strategy for a climate-neutral Europe

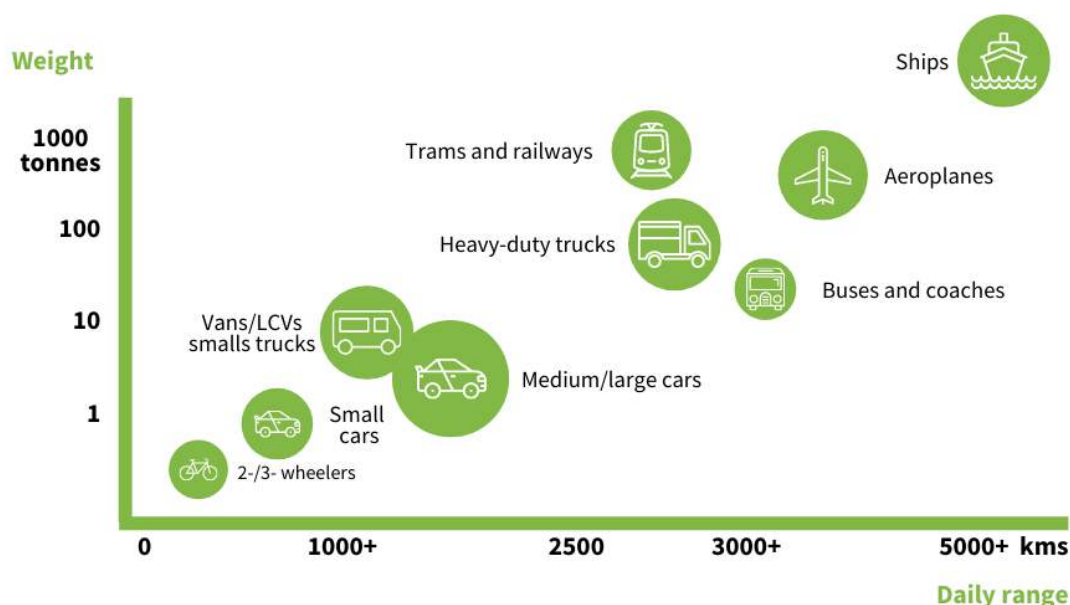
[2] Assumptions: average annual mileage - 120,000 kms/year; fuel consumption - 8kg hydrogen/100 km.

[3] Hydrogen strategies released or planned: Austria, Czechia, Estonia France, Germany, Luxemburg, Poland, Portugal, Slovakia, Spain, The Netherlands.

[4] In the NECPs, Member States lay out the strategies and measures they plan to implement for the period 2021-2030 to comply with 2030 energy and climate targets at EU and national level.

[5] The European Hydrogen Valleys Partnership, launched in May 2019, is part of the Smart Specialisation Platform for Industrial Modernisation of the European Commission and involves 35+ European regional authorities.

Hydrogen vehicles: the most efficient option for decarbonising long-distance and heavy-duty vehicles



Source: [Hydrogen Roadmap for Europe](#), 2019

Hydrogen: paving the way for the decarbonisation of the mobility sector

Hydrogen-powered vehicles maintain the same operational flexibility as conventional engines: long-range, short refuelling time. **Hydrogen is particularly well suited for heavy load, high energy use and harsh operational conditions.** The vehicles can operate 24/7 in all climate conditions without energy loss. Hydrogen-powered vehicles (using hydrogen in gaseous or liquid form) are available or under development in a wide range of transport applications: light commercial vehicles, passenger cars, buses, coaches, trucks (including mining and garbage trucks), semi-trailers, material handling equipment, reach stacker, unmanned aerial vehicles (UAV), Automated Guided Vehicles (AGV), construction equipment (e.g. excavators), trains (regional passenger trains, shunters, locomotives), bicycles, small ships or yard tractors. Hydrogen-based solutions (such as ammonia, methanol, liquid organic hydrogen carrier – LOHC-, and synthetic methane) are currently being considered in the maritime sector and could be explored in other sectors. In the longer term, post-2030, hydrogen-powered aircraft, especially short and medium-range aircraft along with long-range aircraft running on hydrogen-based fuels – i.e. synthetic hydrocarbons using carbon of organic processes or the air – are expected to be made available. Keeping and developing **European industrial leadership** in hydrogen technologies will play an instrumental role to maintain jobs and generate growth across Europe.

In addition, hydrogen technologies are expected to reach **cost competitiveness** with conventional technologies by 2030 or even earlier for long haul trucks and trains[6]. Scale-up is expected to impact the three main cost drivers positively: clean hydrogen production, transmission, and distribution/refuelling where higher load utilisation on infrastructure also plays a role; and components for end-use equipment.

[6] Source: [“Path to hydrogen competitiveness: a cost perspective”](#), Hydrogen Council, 2020

CHAPTER 2

A FOUR-DIMENSIONAL APPROACH

A smooth transition to a decarbonised mobility will require to tackle four dimensions in parallel: **boost both supply and demand of hydrogen-powered vehicles, clean hydrogen as well as hydrogen infrastructure.** This will require financial and non-financial support mechanisms in a transition phase to produce vehicles (and the whole supply chain), to support the purchase and the affordability of the vehicles as well as measures to supply clean hydrogen as a fuel in a cost-competitive manner.

a. Supply of hydrogen-powered vehicles

I. Road transport

EU regulations are in place to tackle GHG emissions from light and heavy-duty vehicles. These pieces of legislations are instrumental in triggering the decarbonisation of the road transport sector and boosting the number of hydrogen-powered vehicles.

Regulation (EU) 2019/631 on CO₂ emission performance standards for passenger cars and vans is foreseen for review in Q2 2021. On the light commercial vehicles category, growing market developments of hydrogen-powered solutions are a clear signal of the readiness level of and concrete ambitions of the sector.

Hydrogen Europe welcomes the upcoming review of **Regulation (EU) 2019/1242 on CO₂ emission performance standards for new heavy-duty vehicles** scheduled for 2022. This review will also consider the opportunity to extend the scope of the regulation to other types of vehicles such as coaches, buses, or semi-trailers, a measure that Hydrogen Europe would welcome. Hydrogen-powered options are being developed in these segments, and an EU-wide regulatory boost would be useful to provide market certainty to industry players to keep and invest further in these market segments.

The CO₂ content of energy carriers and vectors **should become the “new currency” of the energy system.** A transparent mechanism for tracing and tracking the carbon content is a prerequisite.

The current legal framework for reducing CO₂ emissions in road transport is based on a tank-to-wheel (TTW) approach and have proven to be effective. Considering the **well-to-wheel (WTW) approach to analyse the total emissions** could be a helpful tool for a better understanding of CO₂ emissions within a sector. This should go hand in hand with ambitious targets for low carbon fuels and the means to encourage and incentivise such fuels. The well-to-tank (WTT) regulations should be addressed in complementarity (see chapter 2.d).



The **Clean Vehicle Directive 2019/1161** is a useful tool to support the public procurement of clean vehicles from 2021 onwards. Specifically, the fact that 50% of the minimum target for the share of clean buses must be fulfilled by procuring zero-emission buses is a strong push. **If the Directive were to be revised, Hydrogen Europe would welcome an increase of the minimum target for the share of clean buses as well as an extension of the current approach taken for buses to other categories of vehicles.**

Unlike for new vehicles, no EU legislation is in place to tackle GHG emissions from **existing vehicle fleets**. Half of the EU's passenger cars fleet is older than 11 years. For buses as well as for medium and heavy-duty commercial vehicles, the average fleet age is even older than 15 years and up to 21 years in some Member States [7]. The total number of vehicles on the road in 2019 in Europe is 270 million vehicles. Considering the size of the existing fleet, and in light of the Green Deal's objectives, thoughts on tackling GHG emissions from existing vehicles should kick-start. **The potential role that carbon-neutral hydrogen-made fuels** (i.e. hydrocarbons synthesised with carbon from biomass or air) **could play in this respect should be further investigated.**

The Weights & Dimension Directive 96/53 amended by 2015/719 sets maximum dimensions and weights for pan-European cross-border freight traffic, also ensuring that the Member States cannot restrict the circulation of vehicles which comply with these limits from performing international transport operations within their territories. Hydrogen Europe welcomes the flexibilities that the Weights & Dimensions Directive is providing in terms of additional space to integrate hydrogen drives into commercial vehicles, especially into long-haul vehicles. However, **there is still room for improvement to further facilitate a level playing field with other technologies in terms of energy efficiency and driving range.** As an example, the Directive does not take into account some design specificities of fuel cell trucks and their tractor-(semi)trailer combinations could negatively impact the driving range, not fitting customers' expectations. Bearing in mind the decarbonisation objectives set in Regulation (EU) 2019/1242, and the fact that the hydrogen industry expects up to 10,000 trucks by 2025[8] and up to 100,000 hydrogen-powered trucks to be produced from 2030 onwards[9], a review of the Directive should be considered.

Hydrogen vehicles are addressed in the regulation (EU) 2019/2144 - General Safety, e.g. through **UN/ECE Regulation N° 134** (hydrogen vehicle), which defines specific requirements for hydrogen containers to be installed at minimum 200 mm from the board of the vehicle, and significantly reduces the available installation area and container size, thus limiting the driving range of the vehicle. Currently, discussion at the UN working group level is considering **removing the 200mm requirements, which Hydrogen Europe welcomes.** To speed up the process and make it applicable under the EU General Safety regulation, Hydrogen Europe would appreciate it if the EU would support a swift transposition. In addition, the potential negative impact of the **General Safety Regulation** review should also be carefully assessed. Specifically, the Direct Vision requirements would jeopardise the specific design requirement for hydrogen-powered trucks. **Hydrogen Europe recommends the EU Commission to agree on a balanced approach that provides both the improvement of road safety and supports the integration of hydrogen technologies,** paving the way towards a carbon-free transport.

Additionally, **Hydrogen Europe would welcome an alignment between the UN/ECE Regulation N° 134 and UN/ECE Regulation N° 110** (CNG/LNG vehicles) **on the approval of gas cylinder designs** to streamline approval procedures in a safe, quick and cost-effective manner.

[7] Source: FEV

[8] Source: [Joint call for the deployment of hydrogen fuel cell trucks A needed shift towards a carbon-neutral society](#), March 2020

[9] Source: [Coalition Statement On the deployment of fuel cell and hydrogen heavy-duty trucks in Europe](#), November 2020

II. Off-road vehicles

While the type approval regulation for this segment (2018/858) allows innovative technologies to be placed on the market, there is **no dedicated EU regulation pushing to decarbonise it**.

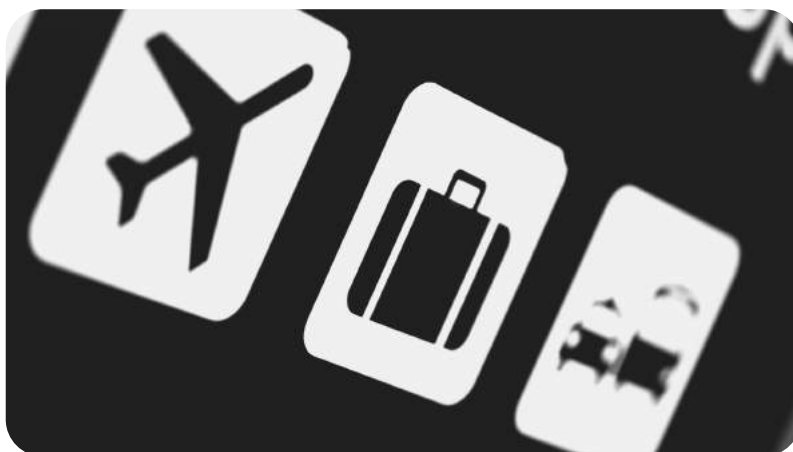
European regulation would be essential to support the uptake of hydrogen options - for example in ports, airports, mines and in the agricultural sector. Hydrogen-powered options can tackle emissions from wider airport operations (ground applications) and can be used for the Auxiliary Power Units (APUs) of aeroplanes.

III. Rail

In Europe, 20% of the rail traffic and about 40% of the mainline network is still being served by diesel technology. **Fuel cell-powered trains are being deployed to replace diesel when conventional electrification by catenary lines is too expensive or unsuitable.** By 2030, 1 in 5 trains could be powered by hydrogen[10]. In view of the 2050 climate-neutral target, the regulatory framework should require Member States to develop plans to decarbonise rail transport, including support for the adoption of hydrogen-powered solutions.

IV. Aviation

Hydrogen-fuelled commercial and cargo aeroplanes are considered a viable option from 2035 onwards. To scale hydrogen-powered aircraft, several technological breakthroughs need to happen before the full potential is reached. While the aerospace industry is planning to collaborate to develop the necessary onboard technologies, the **widespread availability of new fuels like hydrogen and refuelling infrastructure, together with low CO2 means of production, will be key to the overall success of this approach.** Hydrogen or hybrid-electric technologies options should not be dismissed so quickly, especially since they offer synergies in tackling emissions from wider airport operations and can be used for Auxiliary Power Units (APUs). **Research and Innovation efforts and corresponding funding are still required** to reach the necessary technology readiness levels (TRL) levels. Sustainable Aviation Fuels are addressed in chapter 2.d.



[10] [Roland Berger Study on the Use of fuel cells and hydrogen in the railway environment](#), April 2019



V. Maritime

The lifetime of ships (on average 30 years) highlights the urgency of enrolling hydrogen as a fuel as soon as possible. **Fleet renewal takes a long time, and therefore, the transition to alternative fuels needs to start now** to avoid that fossil-fuelled ships will still service global trade and EU-trade in the next decades.

Fuel Cells (FC) and hydrogen have been implemented in submarines for many years. Several small vessels running on hydrogen have been built, and demonstration projects are underway to highlight the viability of hydrogen to power ships using fuel cells and dual-fuel Internal Combustion Engines up to a certain power. **For specific use types** (inland, near coastal), **there is an emerging consensus that FCs are the most promising zero-emission option**. Several design projects are ongoing to test the applicability of FCs to larger vessels. However, due to the magnitude of energy storage and power required in these use cases, there is no consensus on the optimal fuel strategy yet. As there are still technical challenges to be overcome with FC for marine applications, certainly for larger ships, **hydrogen dual-fuel combustion engines could trigger the uptake of hydrogen for the maritime sector as a transitional phase**.

In the European Green Deal Communication, the European Commission proposes to extend the European Emissions Trading System (ETS) to the maritime sector. In its resolution on the European Green Deal, the European Parliament called for measures to move away from the use of heavy fuel oil and for urgent investments in research into new technologies to decarbonise the shipping sector, and in the development of zero-emission and green ships. **The Europe Parliament voted in favour of including the maritime sector in the ETS**. Part of the revenues would go to the Ocean Fund, which is what is needed to trigger the uptake of hydrogen and boost hydrogen technologies. **An extension of the EU ETS to maritime shipping should result in CO2 reduction, limit carbon leakage, accelerate the transition towards clean fuels**, and not hamper the competitive position of the EU market. **We need a European regulation framework with clear and ambitious obligations for the use of hydrogen and hydrogen-based fuels by 2025 and 2030 in the maritime sector**. This needs to be done in parallel with policies to roll out hydrogen infrastructure at EU ports, as well as R&D funding to close technological gaps.

Hydrogen Europe supports the policy initiatives of the EU aiming at decarbonising the maritime sector, namely the:

1. EU-policy on the decarbonisation of ships through energy-efficiency improvements and direct carbon-pricing; EU regulation on Monitoring, Reporting and Verification of GHG emission of ships (EU 2015/757) and the European Emission Trading System (2004/87/EC).
2. Broader regulation to facilitate the uptake of low carbon fuels for maritime, e.g. FuelEU Maritime (see 2.d.)
3. Revision of the Energy Taxation Directive to include maritime fuels (see 2.d)
4. The revision of the EU-directive on the deployment of Alternative Fuels Infrastructure (AFID) (2014/94/EU)

Climate targets can only be achieved with a shift to new technologies. **Putting a price on shipping carbon emissions would be a first step** in establishing a regulatory framework, **provided that the revenues flow back to the maritime sector** where it can act as an important driver for necessary investments in sustainable fuels and infrastructure, green technologies and zero-emissions ships in any waterborne segment.

b. Hydrogen distribution/ Infrastructure

For a clean and affordable hydrogen distribution across the EU: Direct electrification alone is not sufficient for large volumes and is not suitable for all transport applications. Hydrogen offers ways to integrate and transport large quantities of energy over long distance and provide cost-effective seasonal storage. The costs of producing and transporting hydrogen via pipelines are 10 to 20 times cheaper than the cost of transporting electricity via cable[11]. Hydrogen is, therefore, the most suitable scalable tool to decarbonise transport.

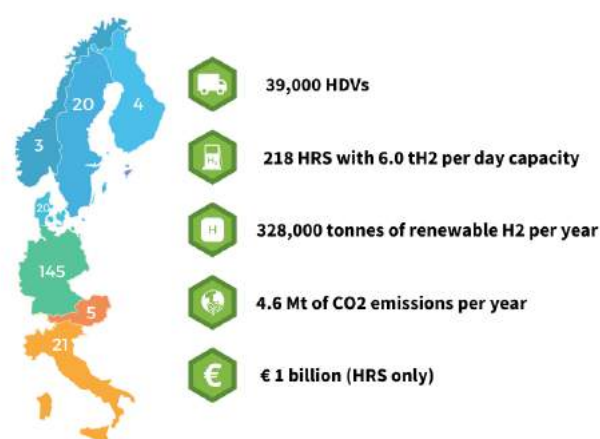
1. Role of hydrogen corridors

The European Hydrogen Backbone, based mainly on **repurposed existing gas grids, can enable a low-cost supply of hydrogen, and support the development of a hydrogen refuelling station widespread network [12]**. The availability of hydrogen, made easily accessible by a capillary hydrogen network, can reduce the HRS investment and operating costs compared to on-site production configuration (instead of using large centralised productions).

The synergies between the **Trans-European Transport Networks (TEN-T) and the Trans-European Networks for Energy (TEN-E)** should be explored further to make a direct link between the fuel source, the optimisation of the production, use and transport of large quantities of hydrogen and the increase of hydrogen demand for the transport sector through the development of hydrogen infrastructure network. When TEN-T and TEN-E corridors are aligned geographically, the HRS network should be strengthened. This is especially valid for HRS on the TEN-T corridors to be used by, e.g. long-haul trucks. Cross-references to TEN-T and TEN-E interlinks should be added to the revised TEN-T and TEN-E guidelines.

One example is the **Scandinavian-Mediterranean TEN-T Corridor**. **If by 2030, half of the trucks driving on this corridor would be powered by hydrogen**, this would mean that 40,000 trucks and 218 HRS would be needed between Italy and Norway. To comply with the CO2 emission standards regulations for HDV, it is estimated that a minimum share of 20% of zero-emission trucks will be needed by 2030. If this project is implemented, **we would have 10% zero-emission trucks already on this TEN-T corridor**. Thanks to this shift, 4.6 Mt of CO2 would be saved annually. Over 300,000 tonnes of renewable hydrogen would be needed to power the trucks, showing how the trucks sector can act as one of the largest enablers of a clean hydrogen economy.

The Scan-Med Corridor in 2030:
50% of the trucks travelling along this corridor will be powered by hydrogen



[11] Source: [Green Hydrogen for a European Green Deal A 2x40 GW Initiative](#)

[12] Source: [European Hydrogen Backbone](#), July 2020

II. Hydrogen refuelling stations (HRS)

The reviewed Alternative Fuels Infrastructure directive (Q2 2021) will be crucial to accelerate the deployment of HRS. For this to happen in the smoothest way, the points below should be considered[13]:

- Hydrogen should be a **mandatory fuel** on the list. Furthermore, the **National Policy Frameworks** submitted by the Member States **should be binding**, while allowing for flexibility in how to achieve the targets.
- **Consider the specificity of infrastructure for heavy-duty vehicles**, supporting hydrogen refuelling stations on the TEN-T Core Network next to those at the logistics centres, depots, and urban nodes.
- **Develop additional technical requirements and CEN/CENELEC standards to enable interoperability** when refuelling hydrogen-powered heavy-duty vehicles. Hydrogen Europe welcomes the mandate that is planned to be given to CEN/CENELEC to develop new standards to support an interoperable hydrogen infrastructure for heavy-duty vehicles (in gaseous and liquid form).
- Consider the added value provided by **multi-purpose hydrogen refuelling stations** at strategic locations that could serve for different transport applications.
- **Provide a clear definition of “recharging or refuelling point accessible to the public”** and extend the scope of the definition, while not hampering innovation.
- Expand the scope of the Directive to **rail infrastructure**.
- Extend the scope of the Directive to **airport infrastructure for ground applications**.
- Provide **hydrogen infrastructure for ships** to meet the needs of the maritime sector. Hydrogen Europe welcomes the mandate that is planned to be delivered to CEN/CENELEC to develop new supporting standards and interoperable ship infrastructure for hydrogen (in gaseous and liquid form), methanol and ammonia supply.
- Emphasise the importance of solutions that can address the entire energy value chain and are scalable such as hydrogen.

The sector forecasts that approximately **1,500 hydrogen refuelling stations for heavy-duty vehicles** will be needed in the EU by 2030[14], especially for regional distribution and long-haul trucks, each with a capacity of 2 tonnes of hydrogen per day[15].



[13] For more info see [HE's dedicated position paper on the AFID](#), Sept 2020

[14] Source: [Joint call for the deployment of hydrogen fuel cell trucks A needed shift towards a carbon-neutral society](#), March 2020

[15] Note that the number of stations depends on various parameters, including fuel consumption. Stations with higher capacities/day will be needed to cover substantial trucks fleets.

c. Demand – Ensure a just transition

For the uptake of zero-emission vehicles, the EU legislative framework and boundaries conditions must be in place in line with the EU Green Deal and 2050 climate neutrality goals.

Complete decarbonisation of the mobility sector will only be successful if there is a push in parallel to support the demand side. The review of the Energy Taxation Directive (ETD), foreseen in Q2 2021, **should set up a fully supportive fuel taxation framework** - which guarantees at least medium-term predictability and stability, and which sets the right price signals while avoiding double taxation in coordination with the EU ETS and carbon border adjustment mechanism (CBAM).

Specifically, from the Impact Assessment released by the EC[16], the revision of the Energy Taxation Directive will explore mechanisms to promote greenhouse gas emission reductions and alternative fuels (such as hydrogen, hydrogen made-fuels, and others) in all economic sectors, including transport. **Hydrogen Europe fully supports the approach that energy taxation should consider the GHG intensity of fuels and develop favourable special tax treatment for renewable and low-carbon fuels** and applications. The details of the differentiated tax treatments should be subject to public consultation. They could encompass scrapping schemes, capped tax rates, full exemption, tax incentives, congestion charge or road toll exemption or reduction (e.g. in Germany, Switzerland[17]), special rates for commercial renewable fuels. The maritime sector is not included in the Energy Taxation Directive recast, which hampers the development of sustainable fuels in this sector. Therefore, **the mandatory tax exemption for fuel used for waterborne transport within the EU should be reassessed**, along with the optional tax exemption for inland waterways transport.

In a transition period, financial and non-financial incentives, including **push and pull measures** will be required, such as direct incentives for the purchase of low carbon/zero-emissions vehicles, access to restricted areas or to specific times, use of dedicated lanes or free or reduced parking fees.

The internalisation of the external costs of transport, i.e. the “user pays” and “polluter pays” principles should be promoted. This would provide incentives for operators to include environmentally friendly solutions to achieve cost parity with traditional fuels. The expected changes in the **Eurovignette Directive** discussions are welcome. **Hydrogen Europe supports** the phase-out time-based charges and their replacement with a **user-based charge based on CO2 emissions and kilometres driven**. Hydrogen Europe urges EU policymakers to finalise the file in 2020 swiftly.

The **prompt adoption of a clear EU terminology for renewable and/or low-carbon hydrogen would be key to incentivise the switch to hydrogen in end-uses mobility applications**. It should consider greenhouse gas emissions from a reasonably complex lifecycle analysis in line with the CertifHy project[16] classification and allow to track primary hydrogen sources to applications and end-uses. Both the EU Taxonomy and the EU Traceability's frameworks should be interoperable with similar worldwide initiatives.

[16] As well as the EC staff working document on the evaluation of the ETD “restructuring the community framework for the taxation of energy products and electricity, from 2019: SWD (2019) 329 final.

[17] For example in Switzerland, zero emission vehicles are exempted from the road tax for heavy duty transport, leading to savings of up 65,000 CH/year.

[18] For further information, please visit www.certifhy.eu



d. Supply of hydrogen as a fuel

I. General

In line with the preparation of the **Clean Hydrogen for Europe**^[19] partnership and its draft Strategic Research and Innovation Agenda (SRIA), **the investment on the supply of low-carbon and renewable hydrogen as a fuel would be a key driver to ensure the competitiveness** of clean hydrogen for all mobility applications, e.g. use in professional vehicles (e.g. buses, light commercial vehicles) in the short-term and low carbon and renewable hydrogen in gaseous or liquid form decarbonise heavy duty mobility for trucks, planes, and ships in a longer-term.

II. Bridging the gap

Favourable fiscal treatment is needed to mitigate investment risk and bridge the cost-competitive gap between conventional and new technologies. Several financial and non-financial support schemes should be considered. To launch the projects, direct fiscal support is needed, such as:

- **Direct financial support** to encourage investments in commercial-scale plants, e.g. capital grants, investment tax credits, loan guarantees. Any fiscal support mechanisms must be guaranteed for a long enough timeframe (e.g., 20 years) to allow appropriate financing to be secured for the plants.
- **Price support mechanisms** for low carbon and renewable hydrogen can be through feed-in tariffs, contracts for difference or differentiated tax rates based on the carbon intensity of the fuel (see chapter 3).

III. Key legislative requests

Mandates can help create a market for low carbon and renewable hydrogen. However, they do not necessarily on their own provide an investable framework. **Any mandate must be part of a wider policy framework** that also provides financial support for first plants and fuels, support for infrastructure, supply-side measures to encourage OEMs to produce alternative fuelled vehicles and demand-side support for consumers. In the framework of the upcoming revision of the Renewable Energy Directive (RED), **the overall renewable energy target should be increased:** The 14% renewable fuel obligation should be significantly revised upwards to promote renewable energy production and underpinned by a **specific dedicated target for Renewable Fuels of Non-Biological Origin (RFNBO) in the transport sector** (similar to the 3,5 % target for advanced biofuels provided by Article 25.1 (b)) **to level the playing field.**

Renewable energy sub-targets and multipliers are essential instruments to (i) incentivise the uptake of renewables in the energy system and (ii) to close the financial gap between the cleaner yet more expensive option and its cheaper fossil alternative for end-customers. However, both instruments are interlinked. Sub-targets will result in an obligation to produce RFNBO and create a “push” in supply. In an emerging market, multipliers will create a stronger demand for RFNBO relative to the fossil alternative and create a “pull” effect. As such, **Hydrogen Europe advocates for an integrated framework, within the RED, whereby both instruments are aligned with each other and are mutually reinforcing.**

[19] [The third public-private partnership, continuation of the FCH2JU](#)

Specific sub-targets for hard to abate sectors including in transport may also be considered to incentivise further and speed-up deployment and adoption of renewable energy in specific sectors and industrial segments. If specific sectoral targets are proposed within the context of RED revision, they should **always be coherent with any other more specific and targeted sectoral legislative initiatives, e.g. RE Fuel Maritime or RE Fuel Aviation.**

The current **Fuel Quality Directive (FQD)** is not in line with the Green Deal objectives. Coherence must be ensured between the FQD, the RED2, sustainability criteria and Indirect Land Use Change (ILUC). If the FQD was to be revised, it could tackle the adoption of a methodology of calculating lifecycle GHG emission thresholds.

The inclusion of energy carriers in the **Emission Trading Scheme** could represent an additional step to consider pushing for carbon-neutral technologies[20].

IV. Maritime transport

Hydrogen Europe welcomes the initiative from the European Commission to accelerate the uptake of alternative fuels for maritime transport, which will lead to goods being delivered most sustainably. Regarding the pathway to sustainable alternative fuels for maritime, Hydrogen Europe considers **performance requirements based on the carbon intensity of the energy used** more suitable than **requirements on the share of specific sustainable alternative fuels to be used in ships fuel**. The more open performance requirements are technology-neutral, which will also lead to innovation in hydrogen technology for maritime application (also for non-propulsion power for auxiliary load). Hydrogen Europe acknowledges that this could provide less certainty for the sustainable fuel suppliers leading to higher investment uncertainty. Thus, it is not a black and white choice and very much depends on the details of the two options.

The **minimum share of sustainable fuels should not be limited to a blending requirement**, as this would exclude some alternative fuels (like ammonia or hydrogen) and would therefore not be truly technologically neutral. Furthermore, the **requirement should be defined on a fleet level** and not at individual ship level – as that would enable to fulfil the obligation more smoothly by introducing several zero-emission vessels.

The International Maritime Organisation (IMO) envisages a reduction of total annual GHG emissions by at least 50% by 2050. However, IMO ambitions are not strong enough: the IMO's ambitions should be aligned with the European Union's targets. **We need a European regulation framework with a clear, predictable, and stable obligation.**



[20] As well as a supportive taxation framework – see points on the Energy Taxation Directive in 2.c

V. Aviation

Sustainable Aviation Fuels (SAF) are the most viable option in the short term. Hydrogen Europe supports the blending of SAF in conventional fuels, as this is the most promising short-term solution for commercial flights and cargo aircraft. SAF are categorised into carbon-neutral drop-in fuels such as synthetic or biofuels and non-drop-in fuels such as liquefied natural gas (LNG), low carbon methane or zero-carbon gaseous (H₂) or liquid hydrogen (LH₂).

Hydrogen Europe **welcomes the ReFuelEU Aviation initiative** designed to increase the uptake of Sustainable Aviation Fuels and thus reduce the carbon footprint of the aviation sector. The initiative is both timely and needed. It is also commendable that the Commission sees a place for electro-fuels produced from low-carbon hydrogen.

The SAF blending mandate is clearly the strongest of measures put forward and - given ambitious targets - can have a meaningful impact. Yet, at the same time, it **should not be defined** literally as a requirement to blend SAF with conventional fuels but rather **as a requirement to introduce a certain amount of sustainable fuels in a total volume of fuel produced or consumed on a fleet level**. Otherwise, the measure would exclude options that cannot be blended with conventional fuels. As a result, it would fail the test of being technologically neutral and run the risk of hindering further research in the field of hydrogen-powered aeroplanes. Therefore, **setting a maximum GHG intensity threshold would be a better solution than a simple volume-based minimum share of SAF**. The latter, even if simpler to implement, would also not take into account that different SAFs have different carbon intensities themselves. The GHG intensity of fuels should be assessed using a full lifecycle approach. Hydrogen Europe also suggests that the required **SAF share should be defined in advance** and for a sufficiently long time, as this would **help to build investor confidence** necessary to facilitate large-scale investments.

The **option of introducing a central auctioning mechanism** whereby SAF producers would be invited by a central auctioning authority to bid at the lowest price to supply a particular volume of SAF to the aviation market over a certain period is also an **interesting** one. Details of the solutions are needed to assess its suitability for the sector properly. However, if successful, it might provide an opportunity for broader use in other sectors, for example, maritime fuels. Hydrogen Europe, therefore, encourages the European Commission to continue to work on this option.



CHAPTER 3

FINANCIAL INSTRUMENTS

Since the start of the COVID crisis, Europe must manage the social, economic and health effects of the pandemic, which leads to the massive reduction in economic activity and loss in income and resources for the industry. At the same time, fulfilling the EU Green Deal objectives will require massive investment from the industry in the coming years.

Hydrogen Europe **welcomes the upcoming review of the State aid rules** and the opportunity provided for public funds to contribute further to meet the European Green Deal objectives. **State aid rules** on energy and environment, regional, research and development and Important Projects of Common European Interest (IPCEIs) **must be tailored to support the deployment of the new Recovery and Resilience facility** and its objective to dedicate more than one third to green projects. The development of the hydrogen economy in the transport sector, along with the other clean hydrogen end-use applications, largely depends on the ability of state aid rules to afford a change in the approach of eligible costs to include additional operational expenditures and increase the notification threshold for clean hydrogen technologies to 200 M.

The **inclusion of additional operational expenditures (OPEX) is especially crucial for rolling out alternative fuel fleets**, where sustainable fuel is currently more expensive than its fossil competitor. For example, for the long haul, only 21% of the TCO is made up by the initial CAPEX. This should be included in the design of funds like the **Connecting Europe Facility (CEF)**. The **CEF Transport budget is dedicated to the implementation of the TEN-T, with the decarbonisation of transport as one of the priorities for the 2021-2027 period**, e.g. by creating a European network of alternative fuels infrastructure and prioritising sustainable transport modes. While CEF can include CAPEX funding of vehicles on top of the infrastructure, this is a relatively low funding rate which only applies to additional costs and thus limits its potential impact. **Hydrogen Europe would welcome an increase of CAPEX funding rate as well as an inclusion of the OPEX funding in both CEF and CEF Blending.**

The **CEF budget should not be limited** to the Core Network and **include the Comprehensive Networks and urban nodes** to reflect the decarbonisation goals in different geographical areas powered by different transport applications (e.g. typically a bus station would be located at a bus depot on an urban node). For rail, eligible projects should support the replacement of diesel propulsion with further rail track electrification and the use of emission-free solutions such as hydrogen-powered trains.

Concerning the **Important Projects of Common European Interest (IPCEIs) tool**, it is imperative to release its full potential and go beyond practice **by using the flexibilities it offers in terms of support for transport and energy projects, 100% coverage of the financing gap and eligibility of OPEX**. Even if the framework can be improved in the upcoming review, IPCEIs already offer a relevant base for the roll-out of integrated hydrogen transport projects across the EU.



Regarding the **European Clean Hydrogen Alliance** and the transport investment projects to be built by the Mobility Roundtable, it is essential that the right conditions are in place, including financial support for projects, to ensure that the objectives of the Hydrogen Strategy are achieved.

In the maritime sector, the '**Ocean Fund**' for the 2022-2030 period would be financed by revenues from auctioning ETS allowances, which would be used to make ships more energy-efficient, to support investment in innovative technologies and infrastructure for decarbonising maritime transport, and to protect marine ecosystems impacted by climate change. The Commission would be required to assess any new global market-based emission reduction measures adopted by the IMO with respect to their ambition and environmental integrity. **Hydrogen Europe welcomes the Ocean fund** as a useful tool to boost the uptake of hydrogen technologies.

There is a lack of clarity of the financial envelopes available through the **Next Generation EU recovery plan**. The ongoing EU discussions should underline a **transversal vision on hydrogen funding opportunities**. National Recovery plans at Member States level should have a strong ambition for hydrogen, as some of them have already shown, with focus on the hydrogen end uses in mobility applications.

The Clean Hydrogen European Partnership (CHEP) is expected to play an instrumental role to foster research and innovation development under Horizon Europe. Hydrogen end-uses in mobility applications (in terms of fuel and infrastructure) should be one of the main strategic orientations of the CHEP 's Annual Work Programmes at least until 2025, in line with the draft SRIA. Hydrogen Europe **welcomes the creation of a pillar dedicated to end-uses applications, including the transport sector**.

The **Cohesion Fund and the European Regional Development Fund (ERDF)** have been providing significant support to sustainable transport. Hydrogen Europe welcomes the political agreement reached on the **Recovery Assistance for Cohesion and the Territories of Europe package (REACT-EU)** and stresses that sufficient funding should be allocated by the Member States to implement objective 2 "Greener, carbon-free Europe" as part of the new Regional Development and Cohesion Policy.



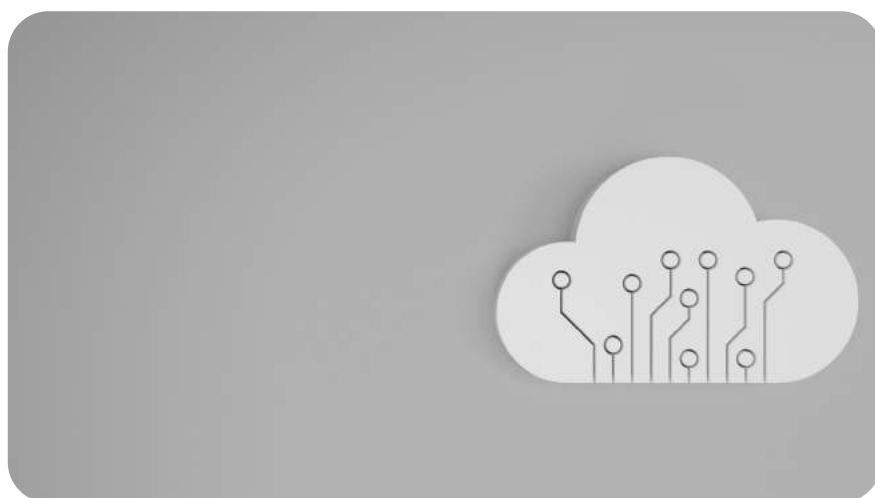
CHAPTER 4

DIGITALISATION WILL NEED HYDROGEN

Hydrogen-powered vehicles will be needed once we reach zero-emission mass market: The emergence of **new business models in transport services, digitalisation, and automation, is expected to generate additional energy demand.** For example, connectivity (with artificial intelligence, Internet of things, more power for video, image processing, and communication) along with increased commercial usage of the vehicles (more mileage expected than today's average). In parallel, safety is an essential element of automated driving – redundancy will be needed to ensure safety which also requires more energy.

Specifically, in a shorter term, for automation Level 2+ and 3: The current and upcoming next driver assistance systems generation will have a much more energy demand on board than previous car models. In a longer-term, for automation Level 4 and 5, tremendous efforts are being made to develop “on-demand mobility” (ODM) services. The final goal is to develop driverless vehicles. In this case, vehicles will need to be equipped with high computing power, redundant sensor, and actor systems. All in all, additional onboard energy will be needed to ensure safety ((e.g. pedestrian protection, lane-keeping technology) while guaranteeing a smooth and convenient driving experience.

This will have a significant impact on the battery and, as a result, could reduce the range of the vehicle. For this reason, it is essential to ensure the development of all alternative fuels such as hydrogen to complement the offer of vehicles and provide the required flexibility in the transport system.






CHAPTER 5

ILLUSTRATIVE EXAMPLES

A dual integrated vision for hydrogen

The identification and creation of **Hydrogen Hubs** foster the kick-start of hydrogen mobility end-uses. Leveraging on economies of scale in strategic locations (e.g. at the epicentres of corridors) will drive at scale competitive hydrogen development, gathering a diversity of public and private actors. Ports and airports are striking examples of this hub vision. **Hydrogen valleys** answer to the same underlying logic. However, they could be defined in a more systemic approach, allowing synergies at a broader geographical scale without being limited to one hub. In both hydrogen Hubs and Valleys, the integration approach is not limited to end-uses mobility applications and can encompass the whole hydrogen value chain.

Ports



Ports will become hydrogen hubs and/or contribute to the “H2 Valleys” where hydrogen can be produced or imported, stored, and distributed for use in different applications such as H2 for trucks and rail (e.g. in port areas where railway electrification is not possible); H2 for inland waterways (for inland ports); H2 for logistics activities. Apart from the mobility sector itself, other concrete integration opportunities exist with H2 for onshore power; H2 for the decarbonisation of terminal and cargo handling equipment; H2 for the industrial hinterland (refineries, chemicals...) for example. A large part of the sources of industrial demand for hydrogen are in or near ports. Only five industrial hubs in Belgium and the Netherlands have a combined local hydrogen demand of 1.7 Mt per year, equivalent to around 20% of total EU consumption today.

Airports

Airports also constitute a striking illustration of the hydrogen hub vision[21]. Allowing hydrogen production infrastructure for aeronautic applications with other hydrogen end-uses will contribute to competitiveness through economies of scale and the multiplication of off-takers. In the transport sector, hydrogen-powered applications can be used on-site for the transport of freight or passengers on the ground and/or as a means of connecting airports to urban areas (for example, the shuttles planned at Toulouse-Blagnac, Cologne or Gatwick airports) or industrial areas. Moreover, outside of the transport sector, hydrogen off-ground applications (e.g. H2 powered baggage tractor in use at the Frankfurt and Hamburg airports) are very suited for airport logistics, offering the same performance in harsh climate conditions without energy/performance losses. Hydrogen is also used for other purposes such as heating the airport or as back-up power, ensuring energy resilience in such strategic locations.

[21] [Hydrogen-powered aviation- A fact-based study of hydrogen technology, economics, and climate impact by 2050](#), Clean Sky 2 JU, FCH 2 JU

IPCEIs - Important Project of Common European Interest

Black Horse is a project that aims to develop green hydrogen ecosystems in Eastern Europe (Poland, Czechia, Hungary, and Slovakia). At its core, a consortium gathering more than 20 companies across seven industries will bolster hydrogen value chains from the production of renewable energy used and the generation of hydrogen with electrolysis to the deployment of hydrogen refuelling stations and trucks. With an investment of about **€6 billion** over the upcoming decade, **270 hydrogen refuelling stations** will be built, and **10,000 new hydrogen trucks** will be on the road. This will save approximately 4 million tonnes of CO₂ per year and create more than **12,000 new jobs**.



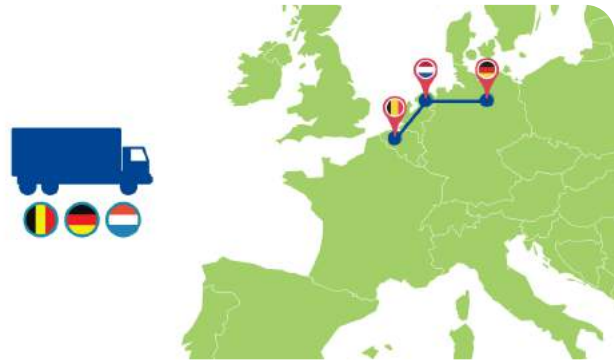
The **Blue Dolphin** project focuses on the role of hydrogen at ports and at sea in Italy, Spain, the Netherlands, Belgium, and Germany. It will exploit this potential by producing a power-generating system for ships based on hydrogen. It will also aim to build cargo ships for liquid hydrogen and hydrogen-powered passenger ships. Blue Dolphin will develop port infrastructure too, by deploying a terminal and bunkering point, as well as LH₂ terminals at selected ports. The seven companies involved in the project will gather investments amounting to **€12.5 billion**. Overall, it will cut carbon dioxide emissions by 1.6 million tonnes per year.



The **Green Octopus** project plans to develop the hydrogen value chain in Belgium, the Netherlands, and Germany, from production and import to infrastructure and hydrogen end uses. With a partnership of 12 supporting members from the industry, Green Octopus is the parent of 50 individual projects representing the whole hydrogen value chain. They will be deployed between 2020 and 2030 and contribute to linking the three countries while developing both local and transnational hydrogen economies. Among others, **20 hydrogen refuelling stations, 250 hydrogen trucks** and **25 hydrogen ships** will be deployed. Projects to decarbonise the refining, steelmaking and chemicals industries via hydrogen are also planned.



HyTruck, a project jointly announced by Air Liquide and Port of Rotterdam in July 2020, aims to build clean heavy-duty transport in Europe by 2025. It will deploy **1,000 hydrogen-powered trucks** by developing semi-captive fleets of tractors for drayage and regional deliveries in and around the main logistics centres of north-western Europe (Port of Rotterdam, Port of Antwerp, German Rhine river ports). It will deploy **25 large refuelling stations** in key areas and include the production of low carbon and renewable hydrogen. The objective is to be competitive with diesel and to replicate the model in other large logistics hubs in Europe.



The **Rainbow UnHycorn** project aims at deploying **50,000 light commercial vehicles**, **25,000 light delivery vans** and **25,000 light delivery trucks** in 20 major European cities. Such volumes would allow to reach a TCO as close as possible to one of the diesel vehicles and save 1 million tonnes of CO2 per year. Supported by the French “Plateforme Automobile Française” (PFA), this project will include various OEMs and equipment suppliers. Moreover, it represents a “mobility usage” brick that can be added to other value chains that focus on hydrogen production to decarbonise industry or focus on heavy-duty trucks. These value chains must integrate hubs such as airports, ports, and valleys.





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