

# Policy support for the UK hydrogen HGV sector

## Executive Summary

The UK government has previously recognised the role that hydrogen trucks will play in decarbonising the transport and freight sectors. Long-term policy, such as the mandatory ban on all non-zero emission Heavy Goods Vehicles (HGVs) by 2040 set out in the Decarbonising Transport plan<sup>1</sup>, and inclusions of fuel cell HGVs in the Future of Freight plan<sup>2</sup> and Hydrogen Strategy<sup>3</sup> confirm that the UK government expects hydrogen powered HGVs to play a role in achieving its net-zero goal by 2050. However, the UK's current policy framework is insufficient to stimulate the growth of the hydrogen HGV sector along the timelines stated to meet the net zero goal. A more supportive and sustained policy framework needs to be put in place to provide sufficient confidence to industry of the UK's commitment to hydrogen trucking and to secure the long-term business case for investment in the deployment of hydrogen HGVs and infrastructure across the UK. Without these policies in place it is likely that the UK will fall behind other major markets such as the EU and USA in the development and commercialisation of hydrogen HGVs and could miss out on the associated industries and employment opportunities created by this sector.

The H2Accelerate collaboration has been formed between bp, Daimler Truck AG, Iveco Group, Linde, Shell, TotalEnergies, and Volvo Group to work collaboratively to develop the evidence base and public funding programmes which can help move European countries towards a commercially viable hydrogen trucking system. Each of these major industrial companies, from both the refuelling and trucking sectors, have made their own organisational commitments to achieving net zero in line with Europe's ambitious decarbonisation targets under the Paris climate agreements.

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<sup>1</sup> ['Transport Decarbonisation Plan'](#) GOV.UK, 12 January 2023

<sup>2</sup> ['Future of Freight Plan'](#) GOV.UK, 15 June 2022

<sup>3</sup> ['UK Hydrogen Strategy'](#) GOV.UK, 13 December 2022

H2Accelerate members believe that the following advances in UK policy will create a stronger framework to support the burgeoning UK zero-emission HGV sector and will help industry to reach the UK's targeted net-zero goals by 2050:

- 1. Adapt the UK implementation of AFIR to set out a minimum level of alternative refuelling network coverage.** Set guidelines that are aligned with the requirements established under the EU's AFIR, which requires publicly available HRS with a minimum capacity of 1 tonne/day to be located every 200km on major (TEN-T) transport corridors and in urban nodes by the end of 2030. The implementation of targets for a minimum network will be a clear signal of intent from the UK government to ensure goals on hydrogen freight are realised. **Furthermore, a second phase refuelling network, to be established along the UK's main transport routes by 2035, is recommended to support the planned ban on sales of diesel HGVs.** The comprehensive network would comprise of around 250 refuelling stations with a total capacity of 500 tonnes of hydrogen per day and able to support around 10,000 Hydrogen HGVs.<sup>1</sup>
- 2. Strengthen and broaden the scope of the plug-in truck grant.** As of July 2023, no hydrogen trucks are eligible for this grant, which aims to support zero emissions HGV deployment.<sup>1</sup> All available zero-emission HGVs should be assessed for the plug-in truck grant, and the grant should cover 80% of the difference in cost between diesel and hydrogen fuelled trucks for the first 1000 trucks in order to bring about near TCO parity between fuel cell and diesel HGVs in the period where deployment is scaling up. Currently, the grant amount of 20% of the purchase price of zero-emission HGVs up to GBP 25,000 (~EUR 29,000) is insufficient to reach comparable total cost of operation between diesel and zero emissions vehicles.
- 3. Adapting the UK standards for RFNBO hydrogen under the RTFO to enable renewable hydrogen producers to access credits under the scheme.** This could be achieved by adopting the EU's interpretation of additionality whereby renewable electricity providers entering operation within 36 months of a hydrogen production plant would fulfil RFNBO additionality requirements. The standards for UK RFNBO hydrogen have limited the efficacy of the RTFO in delivering a wide-spread hydrogen refuelling station (HRS) network, due to misalignment in timelines for additional renewable sources and electrolysis capacity to be brought online.
- 4. Review the Hydrogen Production Business Model (HPBM)'s Heads of Term Agreement to allow the participation of third-party companies.** Similar to the RTFO, the HPBM could provide subsidies for hydrogen fuel. However, the structure of the HPBM's agreement prevents the participation of risk-taking intermediaries in funded projects. As a result, fuel-suppliers are forced to develop their own distribution chains and sign-up customers for projects directly, in place of using existing third-party companies specialised in the distribution and supply of fuel to customers.
- 5. Exemptions for zero-emission HGVs from levies, tolls, and taxes targeting HGVs.** The UK's HGV Road Levy and Vehicle Excise Duty largely treat zero-emission HGVs the same as polluting diesel HGVs. Providing financial differentiation between zero-emission and polluting vehicles will help to bridge the gap between the total cost of operation of zero-emission and diesel HGVs.

The above measures, implemented together, would allow H2Accelerate members as well as other hydrogen truck manufacturers and hydrogen refuelling players to accelerate further commitments such as the development of right-hand drive vehicles that will form the first components of a zero-emission long haul truck sector in the UK, and scale up deployment of trucks and HRS.

## Introduction

Previous whitepapers from the H2Accelerate collaboration have explored the importance of a supportive policy framework for the early-stage adoption and scale up of hydrogen Heavy Goods Vehicles (HGVs). Hydrogen trucks will initially have higher total costs of operation for end-users than their diesel counterparts due to their limited production numbers and early stage of development. Given the fine profit margins and to avoid cost been passed on to the customers of freight companies, favourable policy support to facilitate operational cost parity between hydrogen and diesel HGVs is required to enable adoption.

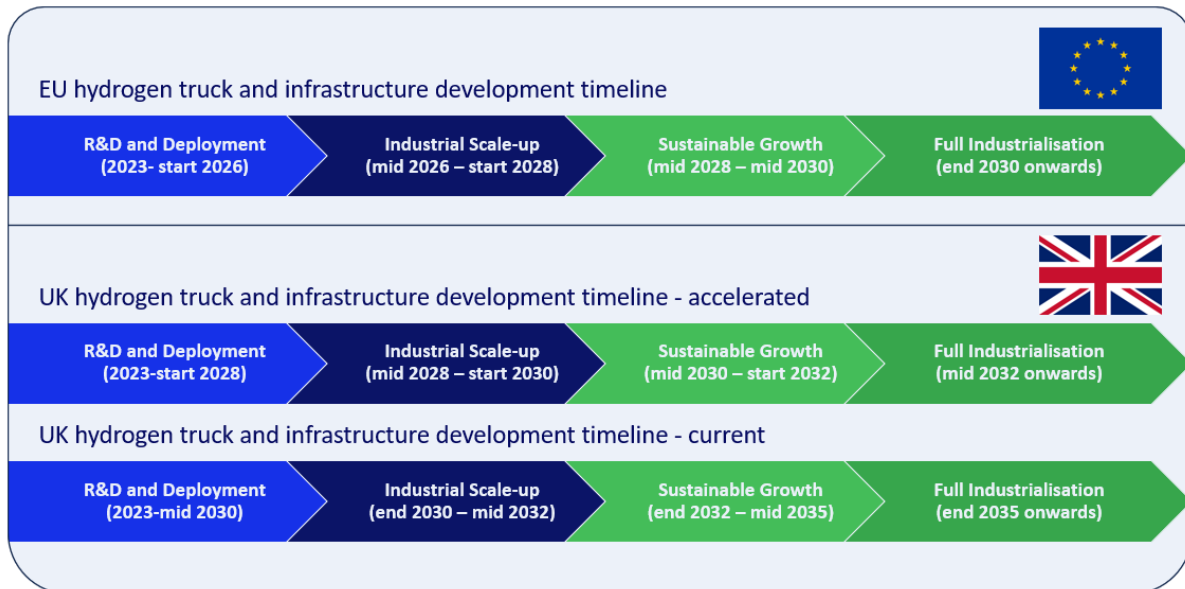


Figure 1 – Comparative timelines for the development of hydrogen trucking industry in the EU and the UK. EU timeline is based on the 'Analysis of cost of ownership and the policy support required to enable industrialisation of fuel cell trucks' H2Accelerate whitepaper.

The recent 'Policy position on heavy-duty hydrogen transport' paper published by the H2Accelerate collaboration discussed the roles of new EU policies in supporting green hydrogen and fuel cell HGVs. This whitepaper expands on this previous analysis to explore the UK's policy and regulatory framework. This assessment of current UK policies results in recommendations for how UK policy could be adapted to encourage the rollout of hydrogen powered HGVs.

## Long term UK strategy for hydrogen in road freight (2035+)

The UK government has been clear on their long-term goals for the adoption of hydrogen technologies within the HGV freight sector as part of its plans to reach net zero by 2050.

The Decarbonising Transport plan, published in July 2021, outlined plans to end sales of all non-zero emission HGVs below 26 tonnes by 2035 and the sale of all non-zero emission HGVs by 2040.<sup>4</sup> This highly ambitious target goes beyond the EU's requirements under the Heavy Duty Vehicle (HDV) CO<sub>2</sub> standards for a 90% reduction in fleet-wide CO<sub>2</sub> emissions of all new vehicles manufactured by 2040.

The Future of Freight plan, published in June 2022, lays out a plan to decarbonise the freight industry in the UK.<sup>5</sup> The plan expects that a combination of modal shift towards rail-based freight and the implementation of zero-emission HGVs, including hydrogen HGVs, will enable the decarbonisation of the sector.

UK government's recognition of the need to decarbonise the road freight industry and the role that hydrogen powered HGVs will play in achieving these decarbonisation targets aligns with H2Accelerate members' views described in '[The need for hydrogen trucking](#)' whitepaper. The paper demonstrated that hydrogen vehicles will be required to fulfil the needs of the longest haul, heaviest duty applications.

## Funding demonstrator hydrogen mobility projects (2023-2028)

To realise the UK's long-term ambitions for hydrogen trucks in the transport sector, large-scale investments are required from both infrastructure players, in developing low carbon hydrogen production capacity, and a national network of refuelling stations, and from OEMs in developing, testing, and scaling up series manufacturing of right-hand drive hydrogen HGVs. Initial projects will see substantially higher operational costs than that of diesel vehicles due to a lack of scale and the need to develop new technologies.

The UK has made a strong start with several HGV focused demonstrator projects and hydrogen mobility projects already in development. These are well funded through government funding schemes including Innovate UK however further funding will be required to build a base network.

### Net Zero Hydrogen Fund (NZHF)

A GBP 240 million (~EUR 276m) fund was created to support projects delivering low-carbon hydrogen production. The Net Zero Hydrogen Fund will support localised hydrogen production, which could be used to deliver cost-competitive hydrogen to refuelling stations across the UK. GBP 37.9 million (~43.6m) in funding was allocated as part of the first round of the competition in April 2022 with a second round having closed in June 2023. Successful projects from the 2022 round include Bradford Low Carbon Hydrogen which will develop HRS for public transport and wider mobility applications.<sup>6</sup>

### Innovate UK Tees Valley Hydrogen Transport Hub

GBP 20 million (~EUR 23m) in funding has been provided towards a research and development competition to establish hydrogen mobility demonstrations around the Tees Valley Hydrogen Hub. The

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<sup>4</sup> '[Transport Decarbonisation Plan](#)' GOV.UK, 12 January 2023

<sup>5</sup> '[Future of Freight Plan](#)' GOV.UK, 15 June 2022

<sup>6</sup> '[Hygen & N-Gen Bradford Hydrogen Production Facility Consultation Website](#),' Bradfordhydrogen, accessed 25 October 2023.

Transport Hub Master Plan, developed in March 2021, contained plans to develop hydrogen HGV projects. These plans included support for a long-distance refuelling corridor for HGVs with stations capable of supplying 2 tonnes of hydrogen per day, refuelling infrastructure for intraregional HGV transport, and replacement of the regional HGV fleet with fuel cell vehicles.<sup>7</sup>

### **Automotive Transformation Fund (ATF)**

The ATF is a GBP 850 million (~EUR 977m) fund administered through the UK's Advanced Propulsion Centre to support 'the large-scale industrialisation of an electrified supply chain [for the UK automotive sector]'.<sup>8</sup> Supporting both battery electric and hydrogen powered vehicle projects, the fund has previously provided GBP 60 million (~EUR 69m) towards the construction of a GW-scale fuel cell factory targeting fuel cells for deployment in HGVs.<sup>9</sup>

Hydrogen Internal Combustion Engines (ICEs) have seen a resurgence in interest in the UK, and, as of October 2023, the ATF is considering expanding its support to hydrogen ICE projects.<sup>10</sup> Hydrogen ICEs are being considered as a transition technology towards more efficient fuel cell vehicles, which could enable the rapid expansion of hydrogen in mobility applications.<sup>11</sup>

### **Zero Emissions Road Freight Demonstrator (ZERFD) programme**

The Zero-Emission Road Freight Demonstrator (ZERFD) programme was designed to produce comparison projects for battery electric and hydrogen fuel cell HGVs for long distance and upper weight limit freight vehicles. The competition closed in October 2022. Two of the four winning projects announced in October 2023 will develop hydrogen freight demonstrators. The HyHaul project will target the development of HRS and hydrogen trucks, while the ZEN Freight project will target both hydrogen and battery electric trucks and infrastructure. The two projects were in receipt of GBP 86.4 million (~EUR 99m) of funding covering up to 80% of capital costs and 70% of research and development costs for the projects.

The aim of the hydrogen fuel cell strand of ZERFD was to 'kick-start the deployment of long haul zero emission HGVs, with a multi-year demonstration of 40-44t hydrogen fuel cell trucks. Including the development of the required business models for scalable deployment and a network of dedicated infrastructure.<sup>12</sup> The ZERFD programme will be used to 'inform future policy decisions and infrastructure choices' for the UK zero-emission HGV sector.

### **First phase network coverage for a UK hydrogen powered HGV network**

The EU's Alternative Fuels Infrastructure Regulation (AFIR) has set out mandatory requirements for an HRS network across Europe. HRS will need to be located in urban nodes and along Europe's core road transport network (the TEN-T core network) at intervals of no greater than 200km and must have the capacity to provide 1-tonne a day of hydrogen fuel at 700 bar pressure.

H2Accelerate members have set out plans to deploy a series of AFIR compliant HRS across Europe. Member of the collaboration have received funding through the Connecting Europe Facility Alternative

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<sup>7</sup> ['Tees Valley Multi-Modal Hydrogen Transport Hub'](#) GOV.UK, accessed 10 July 2023

<sup>8</sup> ['Automotive Transformation Fund - Advanced Propulsion Centre'](#), 8 September 2021

<sup>9</sup> ['Johnson Matthey Announces New Hydrogen Gigafactory to Accelerate the Transition to a Decarbonised Transport Economy'](#), matthey.com, accessed 30 October 2023

<sup>10</sup> ['Rishi Sunak Backs Hydrogen Vehicles after Warning That UK Was Being "Left Behind"'](#), accessed 30 October 2023,

<sup>11</sup> ['Benefits of Hydrogen Engines in Transportation'](#) Cummins Inc., 9 September 2022

<sup>12</sup> ['Competition Overview - Zero Emission Road Freight Hydrogen Fuel Cell Truck Demonstration - Innovation Funding Service'](#) accessed 5 July 2023

Fuels Infrastructure Facility (AFIF) call to deploy 29 heavy-duty HRS by 2026 and will develop technologies for innovative dual-pressure HRS, capable of providing at least 1 tonne/day of either 350 bar or 700 bar hydrogen.

Using the EU’s AFIR as a guideline and based on members’ published first phase deployment plans, the collaboration has proposed a minimum network of HRS to support the UK’s first phase of long-haul hydrogen HGV deployment.

A proposed network of eleven HRS along the major UK road freight transport routes, compliant with the minimum standards under AFIR is presented below.

<b>UK Phase 1 HRS network</b>	<b>Values</b>
Capacity of fuel station per day (kg)	1000
Number of fuel stations in phase 1	11
Total number of HGVs supported in stage 1	220 <sup>13</sup>
Cost of diesel HGV (GBP)	88,000 <sup>14</sup>
Cost of HGV hydrogen vehicle (GBP)	447,000 <sup>15</sup>
80% subsidy cost of hydrogen HGVs (GBP)	63m <sup>16</sup>
40% subsidy for 11 HRS (GBP)	18m <sup>17</sup>
<b>Total subsidy for UK phase 1 hydrogen HGV network (GBP)</b>	<b>81m</b>

<sup>13</sup> Based on 1 tonne/day x 11 stations x 70% capacity factor / 35kg/day consumption per vehicle= 220

<sup>14</sup> Data sourced from National Platform for Mobility diesel truck SZM in 2022

<sup>15</sup> Data sourced from National Platform for Mobility SZM in 2023

<sup>16</sup> Based on GBP 359,000 difference in diesel and fuel cell HGV price x 80% subsidy x 220 vehicles = GBP 63.2m (rounded to 63m)

<sup>17</sup> EUR 42m H2Accelerate members bid for 30% subsidy of the construction of 29 HRS under the Connecting Europe Facility Alternative Fuels Infrastructure Funding call x (40% /30% - conversion factor for 40% subsidy) / 29 x 11 = EUR 21.24m = GBP 18.48m (rounded to GBP 18m)



Figure 2- Adapted from National Highways network map.<sup>18</sup> Proposed network route is based on the original UK TEN-T routes prior to the UK's exit from the EU.<sup>19</sup>

HRS are indicative locations at intervals no greater than 200km and are assumed to have a hydrogen capacity of 1-tonne per day. Hydrogen supply and customer needs will also drive the precise location

<sup>18</sup> National Highways, '[Roads We Manage - National Highways](#)' (National Highways, 19 March 2020), Worldwide

<sup>19</sup> CEDR, '[Trans-European Road Network, TEN-T \(Roads\): 2019 Performance Report](#)', 2019

of these stations. These eleven HRS would support an initial 220 40-tonne hydrogen powered HGVs. H2Accelerate members believe this initial network could be delivered for GBP 81m (~EUR 93m) in direct subsidies for both vehicles and refuelling stations. In the previous H2Accelerate whitepaper exploring the first phase of fuel cell truck and infrastructure deployment, H2Accelerate members set out a planned delivery schedule to existing customers through the H2Accelerate TRUCKS project of 150 vehicles by the end of 2026.<sup>20</sup> Based on production timescales for these first vehicles, H2Accelerate members believe that they can deliver 11 HRS and 220 right-hand drive hydrogen trucks to the UK by 2028 provided that the right funding support is put in place by the end of 2024.

The above analysis demonstrates that the funding received by projects funding hydrogen trucks through ZERFD (GBP 86 million, EUR 99 million) could be partly sufficient to support the first phase of heavy-duty hydrogen truck and refuelling station roll-out compliant with the minimum network coverage. Additional funding will be required as a portion of the ZERFD funding will be used for the development of comparator battery-electric trucks and infrastructure. Along with further hydrogen mobility project funding, such as the Tees Valley Hydrogen Transport Hub, and broader hydrogen project funding, such as the Net Zero Hydrogen Fund (NZHF) and Automotive Transformation Fund (ATF), the UK's R&D & Deployment phase of hydrogen powered HGVs and infrastructure looks to be appropriately funded.

## **Funding the industrial scale-up phase (2028-2030)**

The previous H2Accelerate whitepaper analysing the Total Cost of Ownership for hydrogen and diesel trucks demonstrated that beyond the first R&D & Deployment phase, funding support can transition to 'per vehicle' and 'per station' schemes once a minimum level of infrastructure coverage is reached, in a so called 'industrial scale-up phase'.

In the industrial scale-up phase, the first series-produced hydrogen powered HGVs will emerge alongside expansion of infrastructure to match uptake of vehicles. To encourage industry to develop series-produced vehicles, a combination of policy support and direct subsidies for hydrogen trucks will be required to bridge the TCO gap with equivalent diesel vehicles and mitigate some of the risk involved in developing these technologies. Appropriate policy support and 'per vehicle'/'per station' subsidy schemes have not yet been announced in the UK.

### **The plug-in truck grant**

The plug-in truck grant provides a subsidy to the purchase price of zero-emission HGVs. Currently, the grant is set to 20% of the purchase price up to a maximum grant of GBP 25,000 (EUR 28,000) per vehicle. To qualify, zero-emission truck must be heavier than 12,000kg, have CO<sub>2</sub> emissions at least 50% less than the equivalent conventional Euro VI vehicle that carries the same capacity, and be able to travel at least 96km (60 miles) without any emissions. Hydrogen HGVs meet the minimum vehicle requirements for the plug-in truck grant, but have not been assessed for the scheme and, as of July 2023, no fuel cell HGV is eligible for the subsidy.

Concerns regarding the plug-in truck grant have been raised related to the small number of vehicles which currently qualify for the grant and the relatively small grant sum per vehicle.<sup>21</sup> This is confirmed through analysis conducted by the H2Accelerate collaboration and published in the 'Total Cost of Ownership and Policy Support Analysis' whitepaper, where the anticipated capital costs per vehicle of

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<sup>20</sup> H2Accelerate '[Expectations for the first phase of the fuel cell truck and infrastructure deployment](#)'

<sup>21</sup> '[Electric and Hydrogen-Powered Trucks](#),' *SMMT Media Centre* (blog), 18 April 2023



fuel cell HGVs in the period from 2028-2032 are expected to be in the range of GBP 70,000-157,000 (EUR 80,000-180,000) greater than their diesel equivalents.<sup>22</sup>

Equivalent schemes to the plug-in truck grant, conducted in Germany for example, provide stronger support for zero-emission HGVs and cover up to 80% of the capital cost difference between zero-emission trucks and conventional diesel vehicles (up to GBP 478,000, EUR 550,000).<sup>23</sup> France offers a similar scheme covering up to 100% of the capital cost difference between zero-emission and diesel HGVs.<sup>24</sup> Other EU member states which have implemented similar schemes to the plug-in truck grant, offering greater grant amounts for hydrogen fuelled HGVs than the UK, include Austria, Belgium, Croatia, Denmark, Ireland, the Netherlands, Poland and Spain.<sup>25</sup>

**Policy Recommendation: Adopt a hydrogen HGV subsidy scheme which will provide 80% of the difference in price per vehicles compared with diesel equivalents.**

H2Accelerate members suggest that the plug-in truck grant should be reframed to become more inclusive and technology neutral; hydrogen HGVs should be assessed under the scheme. Additionally, the grant amount should be increased to cover up to 80% of the difference in price per vehicle between diesel and hydrogen fuelled trucks. This increased grant would enable appropriate support for vehicle OEMs to mitigate the risk involved in developing series production of hydrogen HGVs and the grant value would decrease as economies of scale are developed through series production. It is suggested that this scheme should extend to the first 1,000 hydrogen HGVs to support an initial ramp-up in production and allow the capital costs of vehicles to be reduced through economies of scale and supply chain maturation.

## The Renewable Transport Fuel Obligation (RTFO)

The RTFO is a mechanism designed to support renewable fuels within the transport sector. The RTFO places obligations on fuel suppliers to incorporate minimum volumes of renewable fuels, such as biodiesel or renewable hydrogen into their fuel supply each year, while generating subsidies for renewable fuel suppliers.

Suppliers of renewable fuels, such as biofuels or renewable hydrogen, are awarded Renewable Transport Fuel Credits (RTFCs) per litre (or equivalent measurement) of renewable fuel supplied. Certain fuels, such as Renewable Fuels of Non-Biological Origin (RFNBOs – defined below) or advanced biofuels, are subject to double counting, where each litre is awarded two credits per litre equivalent. Certain particularly desirable renewable fuels, identified in the RTFO compliance guidance<sup>26</sup>, are awarded a separate credit called a development RTFCs (dRTFCs) designed to stimulate demand for these desirable fuels. Renewable hydrogen which meets the RFNBO standard is eligible for dRTFCs. All fuel suppliers providing greater than 450,000 litres of fuel per year are obliged to produce credits (RTFCs and dRTFCs) equivalent to a percentage of their total fuel supply under the RTFO. In 2028, this will amount to 17.9% (15.6% RTFCs and 2.4% dRTFCs).

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<sup>22</sup> H2Accelerate Collaboration, '[Analysis of cost of ownership and the policy support required to enable industrialisation of fuel cell trucks](#)', 2022

<sup>23</sup> '[How to Buy an Electric Truck](#),' Transport & Environment, 24 November 2022

<sup>24</sup> '[Écosystèmes Des Véhicules Lourds Électriques 2023](#)', Agir pour la transition écologique | ADEME, accessed 25 October 2023

<sup>25</sup> '[How to Buy an Electric Truck](#),' Transport & Environment, 24 November 2022

<sup>26</sup> 'Renewable Transport Fuel Obligation (RTFO): [Compliance, Reporting and Verification](#)', GOV.UK, 14 June 2023, '

If suppliers wish to buy out of any of their obligations to supply RTFCs and dRTFCs, they must pay an exemption fee for each litre of fuel that they would like exempt from the requirement. This amounts to GBP 0.50 (EUR 0.57) per RTFC credit exemption and GBP 0.80 (EUR 0.92) per dRTFC credit exemption. RTFCs and dRTFCs are traded between suppliers of renewable fuels (such as RFNBO hydrogen) and fossil fuel providers at market rates. For RTFCs market rates have typically remained around GBP 0.30 (EUR 0.34) in the period between 2019-2023. In effect, the RTFO acts as an obligation on fuel suppliers while applying a carbon tax on fossil fuel suppliers and provides a market-led subsidy for renewable fuel suppliers.

Under the RTFO, a kilogram of RFNBO hydrogen is equivalent to 4.58 litres of renewable fuel and, through double counting, is eligible for 9.18 dRTFCs.<sup>27</sup> In theory, the subsidies offered under the RTFO for RFNBO hydrogen could amount to over GBP 6 (EUR 6.89) per kg-H<sub>2</sub>, providing good support for the hydrogen transportation industry. In practice, the UK's standards for RFNBOs have limited access to this subsidy, and the variable return inherent to a market-led subsidy has not provided the confidence to industry to provoke widespread roll-out of RFNBO hydrogen production. The subsidy under the RTFO must be made more accessible for RFNBO hydrogen producers for the RTFO to have a meaningful impact on the development of a hydrogen fuel infrastructure and vehicles market.

### **UK standards for Renewable Fuels of Non-Biological origin (RFNBOs)**

The UK has implemented different standards for RFNBOs than have been recently established in the EU. For hydrogen to meet RFNBO standards in the UK, it must be produced from renewable electricity sources which meet an additionality requirement (renewable electricity generation capacity from new, upgraded, or recommissioned sites brought online at the same time, or after the hydrogen production plant) and a carbon intensity below 32.9gCO<sub>2</sub>eq/MJ. An exception to the additionality requirement is the use of curtailed renewable electricity generation which may make use of waste electricity from existing renewable electricity generation as long as the appropriate evidence for curtailment is in place.<sup>28</sup> For RFNBO hydrogen production plants using grid electricity supplied under a Power Purchase Agreement (PPA) from a renewable electricity supplier meeting the additionality requirements, or the conditions for use of curtailed renewable electricity, “temporal correlation between electricity generation and electricity consumption must be demonstrated. This can be demonstrated over a settlement period of up to 30 minutes.”<sup>29</sup>

Recently, the Delegated Acts agreed in the EU in March 2023 and formally adopted on the 20<sup>th</sup> of June 2023 presented a phased approach to time-matching and additionality requirements to enable the green hydrogen market to establish itself before heavy regulations are applied. European RFNBO hydrogen can be produced via a direct connection, or grid-connection with a PPA, to renewable electricity suppliers which entered operation within 36 months of the hydrogen production plant starting operation. Hydrogen production projects entering operation prior to 2028 are exempt from this additionality requirement. This provides flexibility in delivering hydrogen production and renewable electricity projects while maintaining a commitment to develop green hydrogen through new renewable electricity. Furthermore, until 1st January 2030, grid-electricity used by a hydrogen production plant under a PPA with a new renewable electricity supplier is only required to be time-matched within a calendar month. After 1st January 2030, the time-matching will be tightened to require matching every hour, but the rest of the decade is provided as a transition period to develop green hydrogen production capacity in Europe. A tighter carbon-intensity requirement has now been

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<sup>27</sup> Renewable Transport Fuel Obligation (RTFO): [Compliance, Reporting and Verification](#), GOV.UK, 14 June 2023, <sup>1</sup>.

<sup>28</sup> RTFO Guidance update July 2023

<sup>29</sup> RTFO Guidance update July 2023

implemented for European RFNBO eligible hydrogen, with a requirement for lifecycle carbon intensity to be below 3.38kg-CO<sub>2</sub>eq/kg-H<sub>2</sub> (~28.2gCO<sub>2</sub>eq/MJ).

The RTFO has the potential to be a strong legislative tool for supporting the roll-out of zero-emission HGVs by providing a large portion of the financial support required to bring about comparable operational costs for hydrogen powered HGVs relative to diesel HGVs in the industrial scale-up phase and beyond. However, a market-led subsidy does not provide adequate long-term financial security for industry to develop the UK's hydrogen production capacity and refuelling network as this subsidy could diminish throughout the lifetime of a project. An HRS network with 500 tonnes per day of hydrogen production (the anticipated capacity required by 2035 to help reach freight decarbonisation targets) could result in an additional 1.6 billion dRTFCs being issued, representing a substantial increase in the supply of credits in the RTFO market. In 2021, around 5 billion credits (dRTFCs and RTFCs) were required to meet the RTFO.<sup>30</sup>

Furthermore, meeting UK RFNBO standards under the RTFO has proved difficult to implement due to the tight requirements for additionality and time-matching. The strict requirements have stifled the deployment of RFNBO hydrogen eligible for credits which has limited the business case for refuelling stations providing green hydrogen molecules. As the number of HRS increases and an increased quantity of RFNBO hydrogen is produced, the subsidy provided by the RTFO is likely to decrease. This will impact hydrogen fuel suppliers whose business cases are based on this subsidy. Further policy support will be required in the longer term to support hydrogen trucks.

**Policy Recommendation: Adopt a more flexible additionality criteria for green hydrogen to meet RFNBO standards under the RTFO.**

The H2Accelerate collaboration suggests that the UK should allow greater flexibility within the additionality requirements for RFNBO standards under the RTFO to enable separate development of renewable electricity production and electrolyser facilities as the sector scales up. Renewable electricity providers entering operation within 36 months of a hydrogen production plant should be considered to have fulfilled the RFNBO additionality requirements until at least 2030. Adopting this broader interpretation of additionality would enable easier development of RFNBO hydrogen projects, enabling access to dRTFCs and in turn accelerating the development of the UK hydrogen trucking industry. With these changes, the RTFO could support the attainment of acceptable operating costs for the end users of hydrogen trucks during initial roll-out.

### **The Hydrogen Production Business Model (HPBM)**

The HPBM represents an excellent method of supporting industrial scale generation of low-carbon hydrogen by developing long-term certainty in the price of that hydrogen. Operating as a Contract for Difference (CfD) for selected hydrogen production projects the HPBM will aim to initially subsidise 1GW of green hydrogen production and 1GW of blue hydrogen production.

Like other CfDs, which have successfully subsidised low-carbon electricity projects in the UK,<sup>31</sup> the HPBM will look to accelerate the development of a liquid market for low-carbon hydrogen. It will achieve this by bringing about parity between the price of low carbon hydrogen and fossil fuel intensive alternatives. For the mobility sector, this would support cost production parity for hydrogen fuel in line with diesel prices, with strike prices for the CfD agreed on a per project basis. The CfD

<sup>30</sup> Department for Transport, 'Renewable Transport Fuel Obligation Annual Report 2021'.

<sup>31</sup> Department for Business, Energy, and Industrial Strategy, '[Evaluation of the Contracts for Difference Scheme](#),' June 2019

contracts will be in operation for 15 years, providing long-term certainty for the price of hydrogen fuel for selected projects.

However, the current formulation of the HPBM places constraints on the access of this subsidy for HRS. The exclusion of “Risk-Taking Intermediaries” (third-party companies that would store and distribute low-carbon hydrogen from producers to customers) will necessitate producers to develop their own storage and distribution facilities and sign-up customers directly. This is likely to limit the number of eligible projects and thus limit the scale of development of HRS by limiting access to the HPBM subsidy.

**Policy Recommendation: Review the HPBM heads of term agreement to enable the participation of third-party companies.**

H2Accelerate members believe that the involvement of third-party companies will be important in rapidly scaling the UK’s hydrogen trucking sector and recommend a review of the heads of terms of the HPBM to enable more rapid scaling of the UK hydrogen mobility sector.

### **Industrial scale-up phase support for hydrogen HGVs**

The HPBM and RTFO present potential tools in producing competitive low-carbon hydrogen fuel to help bridge the TCO gap with diesel trucks. However, these subsidies should be made more accessible for fuel suppliers to enable early and rapid scaling of production. Additionally, these subsidies will need to be paired with appropriate subsidies for vehicles if hydrogen truck sales are to scale up and contribute to net zero targets within the road freight sector.

Further support is necessary beyond the initial funding phase under ZERFD for zero-emission HGVs and supporting infrastructure. The UK’s existing subsidy mechanisms in the form of the RTFO and HPBM, subsidising low-carbon hydrogen, and the plug-in truck grant, subsidising zero-emission vehicles, will need to be adapted to provide industry players with the confidence to invest in an expanded hydrogen truck and hydrogen refuelling network beyond the initial trials. The recent rollback of net-zero policies announced by the UK government will impact industry’s confidence in the UK’s long-term commitment to the hydrogen mobility sector.

### **Longer term support for hydrogen HGVs (2030+)**

To enable businesses to make investments of the scale required to decarbonise the road freight sector, the long-term business case for hydrogen trucks in the UK must be secured through sustainable policy mechanisms as the sector scales up to full industrialisation and moves away from a reliance on vehicle subsidy schemes. Supportive policies which help to bridge the TCO gap can contribute to this certainty. Previous H2Accelerate analysis of the EU’s policy framework suggests that cost parity between hydrogen and diesel trucks could be achieved by 2035 with the right level of support in the period leading up to this. Policy such as carbon taxes, differential road tolls, excise duty on diesel, and credits for renewable hydrogen can allow operational cost parity to be reached earlier.

The RTFO and HPBM, described in the previous section, have the capacity to supply sizeable credits for renewable hydrogen and enable the long-term business case for hydrogen trucking in the UK. However, the difficulty in accessing these credits, and the uncertainty presented by a market-led credit scheme has reduced the efficacy of these subsidies in delivering a large-scale hydrogen refuelling network. The RTFO and HPBM, in their current forms, require structural changes to support business investment. If completed, they may enable the UK to be a world leader in the hydrogen mobility market.

## **Adapting existing UK policy to better support zero-emission HGVs (HGV Road Levy and HGV VED)**

The UK applies both a time-based vignette and excise duty on HGVs. However, neither of these policies currently support the roll-out of zero-emission HGVs.

### **HGV Road Levy**

The Heavy Goods Vehicle Road levy is a time-based vignette for HGVs in the UK. It was suspended as part of a stimulant package during the pandemic to encourage HGV operation in the UK, but re-entered law on 1st August 2023. Annual road levy passes amount to GBP 749 (~EUR 860) for the most polluting vehicles and around GBP 576 (~EUR 660) for Euro VI compliant vehicles. No exemption is made for zero-emission vehicles.

### **HGV VED**

The HGV Vehicle Excise Duty (VED) applies a levy based on the weight and number of wheel axels and suspension type of an HGV. The duty does not differentiate based on the greenhouse gas emissions of HGVs leading to an equivalent VED for zero-emission and diesel vehicles. For HGVs in the range of 40-44 tonnes, an annual HGV VED rate of GBP 850 (~EUR 1,000) would apply.

Both the HGV VED and HGV Road Levy miss an opportunity to differentiate between zero emission vehicles and their diesel counterparts in a meaningful manner. While other countries who adopt emission-based road tolls through the new Eurovignette Directive will create a saving for zero-emission HGVs amounting to over GBP 8,700 (EUR 10,000) per year<sup>32</sup>, the UK's policy scheme may save GBP 175 (EUR 200) per year for a zero-emission vehicle relative to the most-polluting HGVs under their current form. The funds raised from stronger differentiation between diesel and zero emission vehicles could be used to support businesses and manufacturers with the roll-out of zero emission HGVs.

#### **Policy Recommendation: Introduce tax exemptions for zero-emission trucks**

The H2Accelerate collaboration suggests the implementation of an exemption for zero-emission HGVs until 2035 for both the HGV road levy and HGV VED. This would amount to an annual saving of GBP 1,600 (EUR 1,850) per vehicle for zero-emission HGVs. While still not providing the same level of support as the Eurovignette Directive in the EU, this would contribute to bridging the gap in TCO between zero-emission and diesel HGVs while demonstrating further support to industry for zero-emission trucks. Given the limited number of trucks scheduled to be on the road by 2035 which will meet zero-emission standards, this exemption will result in minimal losses in tax revenue and will adapt the existing policy framework to incentivise zero-emission solutions.

## **Defining a minimum coverage network for HRS under the UK Alternative Fuel Infrastructure Regulation (UK AFIR)**

The UK has implemented requirements for public hydrogen road vehicle refuelling points under a UK implementation of the EU's 2017 Alternative Fuel Infrastructure Directive (AFID). These include technical standards for refuelling stations such as hydrogen fuel connectors being compliant with ISO 17268 standards. However, the UK AFIR currently sets out no requirements for a hydrogen refuelling network. H2Accelerate members believe that the introduction of a directive on refuelling network for

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<sup>32</sup> Eurowag, ['New Toll Fees for Trucks in Europe Since 2023'](#) May 2023

hydrogen powered trucks will provide further certainty to industry of the UK's commitment to long-haul zero emission HGVs.

### Targeted hydrogen refuelling network by 2035

UK government has laid out plans for a mandatory ban on all non-zero emission trucks below 26 tonnes by 2035 and all trucks over 26 tonnes by 2040. Appropriate infrastructure to support zero-emission trucks (refuelling stations and recharging stations) must be constructed before the first mandatory ban on non-zero emission trucks comes into effect in 2035. The UK has a medium and heavy goods vehicle fleet around 11.6% of the current European market.<sup>33</sup> A proportional build out of HGV refuelling infrastructure will be required to reach targeted reductions in greenhouse gas emissions from the HGV sector in the UK, as in the EU. To achieve a 50% reduction in greenhouse gas emissions from the freight sector, in line with the EU's targeted reduction between 2030 and 2035, the EU will need around 85,000 fuel cell HGVs and 380,000 battery electric HGVs.<sup>34</sup> To achieve a similar rate of greenhouse gas emissions reduction, the UK will require the following:

- 10,000 fuel cell HGVs on the road in the UK<sup>35</sup>
- 500 tonnes per day green hydrogen production capacity<sup>36</sup>
- A network of around 250 HRS with an average capacity of 2-tonnes per day<sup>37</sup>

The H2Accelerate collaboration suggests that a 2035 target should be set for the roll-out of this second phase HRS network along the UK's main transport corridors. With the right support in place, H2Accelerate members would be able to provide at least 70<sup>38</sup> of these HRS and 4,500<sup>39</sup> hydrogen HGVs by 2035, with the remainder being sourced from a diverse array of other market players.

#### **Policy Recommendation: Directive minimum network coverage for an HRS network**

Phase 1: 2030 - 11 HRS network (11 tonne per day capacity)

H2Accelerate members suggest that the UK should introduce a directive for a minimum network of alternative fuel infrastructure by 2030. This would consist of at least 1-tonne capacity per day HRS located at least every 200km along the UK's major transport corridors. This directive would provide a guarantee to industry of a minimum network coverage for hydrogen trucks by 2030 and could largely be matched by existing funding schemes.

Phase 2: 2035 – 500 tonnes per day capacity.

Furthermore, H2Accelerate members believe that a second phase refuelling network targeted for 2035 will further signal positive intent from the UK government and support the UK's ambitious targets to ban all non-zero emission HGVs by 2040. A suggested second phase refuelling network, with 500 tonne per day capacity, is presented below.

<sup>33</sup> ['Report - Vehicles in Use, Europe 2022'](#), ACEA - European Automobile Manufacturers' Association (blog), 19 January 2022

<sup>34</sup> ['Fact Sheet: CO2 Standards for Heavy-Duty Vehicles'](#) ACEA - European Automobile Manufacturers' Association (blog), 17 February 2023

<sup>35</sup> number of EU fuel cell trucks required (85,000) x 11.6% = 9945, rounded to 10,000

<sup>36</sup> Based on 35kg consumption per vehicle x 10,000 vehicles / 70% load capacity per refuelling station

<sup>37</sup> Based on 500 tonnes of daily hydrogen production / 2

<sup>38</sup> Based on a 28% market share of UK fuel stations owned and operated by H2Accelerate members. [Source](#).

<sup>39</sup> Based on 45% market share of European medium and heavy commercial vehicles in 2021 owned by H2Accelerate members [Source](#).



*Figure 3- Map of 2035 refuelling stations network in the UK which could achieve a 50% reduction in CO<sub>2</sub> emissions. The network will consist of around 250 2-tonne refuelling stations. Adapted from National Highways network map.<sup>40</sup> Based on annual HGV flow on road network in 2016.<sup>41</sup>*

<sup>40</sup>National Highways, '[Roads We Manage - National Highways](#)' (National Highways, 19 March 2020), Worldwide

<sup>41</sup>'[Future of mobility: the UK freight transport system](#)' GOV.UK, 12 February 2019

## Conclusions

**The UK has set-out strong messaging for the inclusion of hydrogen HGVs in its plans to decarbonise road freight and intends to ban the sale of all diesel HGVs in the UK by 2040.** The R&D and Deployment phase of hydrogen HGV roll out is being well funded through targeted demonstrator programmes, including ZERFD. To enable the next phase of development, sufficient funding and policy support is required for the expansion of hydrogen HGVs and infrastructure beyond those supported under ZERFD and enable OEMs and infrastructure players to invest in the long-term business case for deployment in the UK. Clear intent to support the long-term business case for hydrogen HGVs is required to provide certainty to industry and encourage OEMs to develop right-hand drive hydrogen HGVs on the required timelines to meet the UK's plans for road freight decarbonisation. H2Accelerate members believe this could be achieved through the following combination of policy support:

1. All available zero-emission HGVs should be assessed for the plug-in truck grant, and the grant should cover 80% of the difference in price between diesel and hydrogen fuelled trucks for the first 1000 trucks to bring about near TCO parity with diesel HGVs in the period where deployment is scaling up (2028-2030).
2. The UK implementation of AFIR should recommend a minimum level of alternative refuelling network coverage along the UK's main transport routes. A directive HRS network to be developed by 2030 should be laid out with a requirement for HRS every 200km in line with the EU AFIR requirements. Subsequently, a second-phase comprehensive refuelling network, to be established by 2035 in time to support the mandatory transition to zero-emission HGVs, is recommended. The secondary network is suggested to consist of 500 tonnes per day green hydrogen production (circa 250 2-tonne per day HRS) capable of supporting around 10,000 hydrogen powered HGVs in line with a 50% reduction in CO<sub>2</sub> emissions from HGVs by 2035.<sup>42</sup>
3. The UK standards for RFNBO hydrogen under the RTFO should be adapted to enable renewable hydrogen producers to access credits more readily under the scheme. This could be achieved by adopting the EU's interpretation of additionality under the RED II delegated acts.
4. The HPBM heads of term agreement should be reviewed to enable projects targeting the development of HRS. Under the current agreement, the participation of third-party companies is not allowed, forcing fuel-suppliers to develop their own distribution chains and sign-up customers directly. Allowing risk-taking intermediates to participate in HPBM projects would enable more hydrogen mobility projects to access subsidies.
5. Exemptions for zero-emission HGVs from levies, tolls, and taxes targeting HGVs should be applied to help bridge the TCO gap between diesel and zero-emission vehicles.

Despite the UK setting more ambitious targets than Europe for decarbonisation of road freight, its policy framework has begun to fall behind other countries, such as Germany, USA and France. The UK has policies in place which could be adapted to provide the appropriate support for hydrogen powered HGVs and encourage the necessary investments in infrastructure and the series production of right-hand drive vehicles, however these currently fall short of enabling the long-term business case. If the UK is to deliver on its commitments to decarbonising the road transport sector, it will need to develop a stronger policy framework to support zero-emission HGVs. With the implementation of supportive policies, H2Accelerate members are ready and willing to make further investments in the UK that will allow the full industrialisation of the hydrogen freight sector by 2035.

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<sup>42</sup> Based on a blended technology solution modelled by ACEA for decarbonising 50% of the EU HDV fleet and an assumed UK medium and heavy vehicles fleet of 11.6% the size of the EU's. (Source '[Fact Sheet: CO2 Standards for Heavy-Duty Vehicles](#)' ACEA - European Automobile Manufacturers' Association (blog), 17 February 2023)