



INFRASTRUCTURE FOR ZERO EMISSION HEAVY GOODS VEHICLES AND COACHES

CONFEDERATION OF PASSENGER TRANSPORT

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Executive Summary:

- Coaches already provide a sustainable and environmentally friendly travel option and significantly reduce emissions from transport; however, the sector recognises the importance of and is committed to transitioning to zero emission technologies
- A robust and reliable network of recharging and refuelling infrastructure is going to be key to this transition and was a key ask identified by our Zero Emission Coach Taskforce (ZECT)
- It is important that any infrastructure strategy remains technology agnostic and supports both hydrogen fuel cell and battery electric technologies, as well as low carbon fuels to ensure operators can select the technology that best suits their operations
- Low carbon fuels can significantly reduce carbon emissions of the existing vehicle fleet and are expected to play a vital role in the sectors' transition to zero emission, however due to their higher cost and lower energy intensity, a fuel duty incentive is needed to encourage and incentivise their uptake
- Hydrogen can be used as a combustion fuel in a standard engine, which can significantly reduce carbon emissions and has minimal NOx emissions. Increasing the use of hydrogen as a combustion fuel is expected to help stimulate demand from other sectors and create a sustainable supply chain and network of infrastructure
- Depot charging alone will not enable operators to transition all of their services to zero emission, a robust and reliable network of refuelling and recharging infrastructure at motorway stations as well as tourist attraction destinations is going to be key
- A universal standard across the UK as well as internationally is crucial to ensuring both UK and international coach operators can confidently charge at any infrastructure site where needed
- There are similarities between HGVs and coach operations, which presents an opportunity for infrastructure sharing, however any shared sites will need to ensure safe and accessible pick up and drop off points for passengers

About CPT:

We help a dynamic bus and coach industry to provide better journeys for all, creating greener communities and delivering economic growth.

We do this by representing around 900 members from across the industry be they large or small, bus or coach, operator or supplier. We use our influence



to campaign for a supportive policy environment, give our members practical advice and support to run their businesses safely, compliantly and efficiently and bring the industry together to share ideas and best practice. We are ambitious to make things better for passengers, inclusive in seeking out different perspectives and we are always there when our members need us.

Coaches provide a sustainable and environmentally friendly travel option and can significantly reduce congestion, the latest Euro VI coaches emit less nitrogen oxides than the latest diesel cars. Nonetheless the sector recognises that the future of road transport is with zero emissions and are committed to playing a proactive role in transitioning their fleets.

We established the Zero Emission Coach Taskforce (ZECT) in December 2021, bringing together coach operators, manufacturers, government observers, infrastructure and finance providers to identify the challenges to transitioning to zero emission coaches and what is needed to overcome them. One of the key asks identified through this work was the need for a robust, reliable network of recharging and refuelling infrastructure across the strategic road network, as well as at tourist destinations and city centres. We welcome the recognition of this work and the opportunity to provide feedback and continued support to the DfT to ensure the sector can sustainably decarbonise.

CPT Response

Transitional Technologies

Low carbon fuels have been shown to significantly reduce carbon emissions and can provide a transitional solution for the coach sector whilst further developments in zero emission technologies are delivered and the required supporting infrastructure installed.

Biodiesel and Hydrotreated Vegetable Oil (HVO) have been identified as the most suitable options for coaches due to their similarity to diesel. Biodiesel is already present in small percentages in regular diesel, common blend strengths include B20, B30, and B100 and is currently deployed in 8,000 buses across the UK and 300-600 trucks.



Case Study – HVO Trial In 2018, Scania carried out a trial using HVO in collaboration with Lockett's and National Express, to demonstrate how much carbon could be saved if operators used HVO instead of diesel in their operations. All of Scania's engines from Euro IV onwards can be operated using HVO in the same way as diesel, without any engine modifications. The trial was carried out with 14 vehicles, 7 fuelled with diesel and 7 fuelled with HVO, which were operated across two routes – Portsmouth to London and Portsmouth to Brighton. A temporary refuelling station was set up at Lockett's Fareham depot. Testing took place at Millbrook testing ground and found that HVO could reduce carbon emissions by over 90% when compared to diesel, with one coach saving 180 tonnes of CO₂e per annum. HVO also reduced NO_x emissions by 10-29%. The running costs for HVO were shown to be between 5-10% higher at the time of the trial, however there were reductions in the maintenance costs due to HVO burning cleaner, producing less soot and extending the period between oil changes.

Decarbonising coaches, HVO Trial Evaluation: Scania, Lockett's Travel and Green Biofuel, October 2018

To utilise low carbon fuels confidently and efficiently operators would need confirmation from manufacturers that it would be suitable for their vehicles, and higher blends may also require engine modifications.

Additionally, HVO and biodiesel are more expensive and have a lower energy density, meaning more fuel is required to deliver the same range as diesel. Introducing a fuel duty incentive which reduces the cost of low carbon fuels to lower than, or in line with, diesel would significantly help to incentivise and encourage the uptake of low carbon fuels.

A fuel duty incentive applied to low carbon fuels that have renewable fuel blends of 20% or more, with a maximum discount offered of 15ppl for 100% biofuel or HVO, scaled down to 3ppl for 20% blends would cost treasury an additional £1.4 million in 2024, £2.06 million in 2025 and £2.58 million in 2026 if applied to the whole coach sector¹.

Hydrogen can be used as a combustion fuel in an Internal Combustion Engine (ICE), with comparable reliability and durability. Whilst not completely zero emission, it is considerably greener than diesel. This technology has been developed for new vehicles however, existing vehicles can also be retrofitted which has the additional benefit of reducing the carbon footprint from manufacturing new vehicles.

Additionally, enabling the use of hydrogen as a combustion fuel is expected to help stimulate the demand for hydrogen from other sectors, create the necessary infrastructure and develop a sustainable supply chain for the production of green, affordable hydrogen.

It is therefore vital that any developments of infrastructure considers the vital role low carbon fuels can play in road transport decarbonisation, particularly HDVs and coaches.

Zero Emission Coach Technologies

There is currently only one zero emission technology option available for coaches on the market today and that is battery electric. Whilst this is an impressive vehicle, it currently does not deliver sufficient range required for all services provided by coach. We know that there is further development happening in the electric battery coach technology, with Yutong confirming the launch of their newest zero emission coach, the GTe14 which boasts a range of 340 miles.

Hydrogen can deliver a greater range than the current available battery electric technology and has the additional benefit of refueling in a comparable way to diesel, however the development of these vehicles is further behind. We know that Temsa and Irizar launched hydrogen fuel cell vehicles at this year's Bus World Expo, promising a 620 mile range, additionally £534,000 of funding has been provided to Wrightbus via the Advanced Propulsion Centre for the development of a hydrogen coach driveline.

However, all technologies are not without their challenges, and all require a robust, dense and reliable network of infrastructure to enable all coach operators to continue to provide their wide range of services.

It is therefore important that both zero emission technologies are supported, to ensure that coach operators have a choice of zero emission drive train technologies and can select the technology that best suits their operations.

Zero Emission Coach Refuelling and Recharging Infrastructure

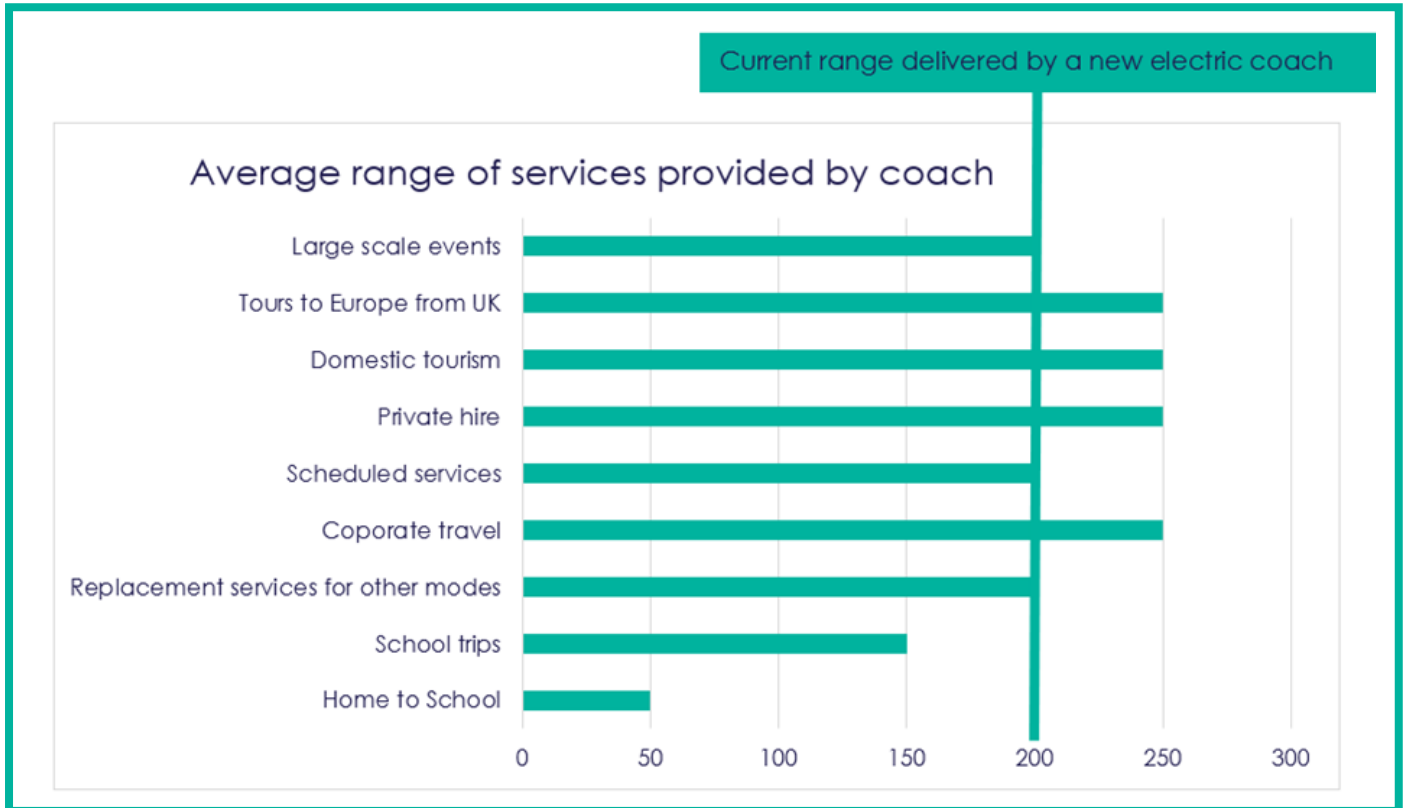
Electric infrastructure

The current zero emission coach that is available on the market today, whilst impressive, does not yet enable coach operators to provide 100% of their services. Additionally, the increased weight and size of the battery reduces luggage capacity of the vehicle, further increasing the challenge of transitioning holiday and tour services. Introducing a robust and reliable recharging and refueling network, whilst will not not completely solve the issue, will help. We will be completing work in the New Year to explore the



role of increased axle weights and the potential benefits this has for luggage capacity.

The graph below shows the ranges for the services currently provided by the coach sector, which typically vary between 50-250 miles.



Average range of services provided by coach in miles, CPT Coach Operator Survey 2023

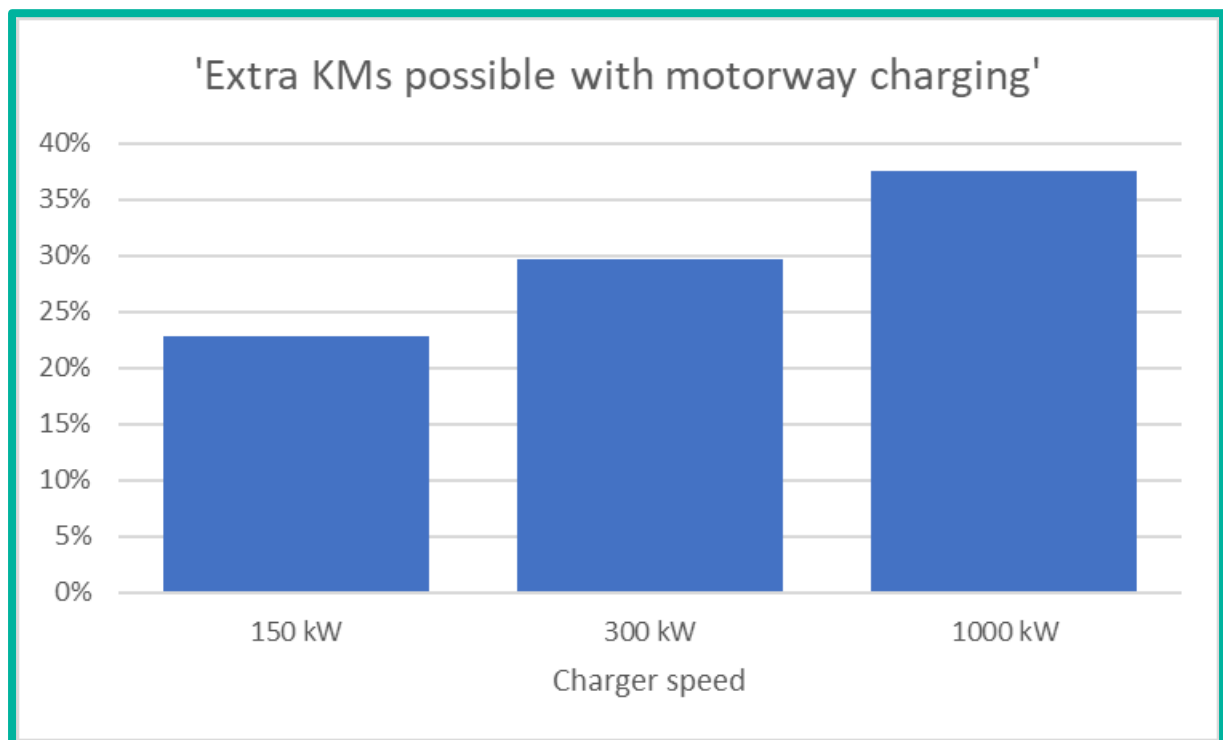
Scheduled services typically average around 200 – 250 miles per service, with multiple services being operated daily, making the required range closer to 500 miles². Additionally, 72% of coach operators fleets will deliver a combination of two or more services, for example a driver will provide a home to school service, and then go on to private hire services. It was therefore determined that only 50%³ of coach operators current services can be delivered by the available zero emission technology. For 100% of services to be delivered by zero emission vehicles, operators either need a solution that delivers greater range, or a robust network of infrastructure.

This research is supported by analysis by BluMarbl of 30,000,000 kms of trip information provided by coach operators which identified that depot charging alone will not provide enough range for coach operators to utilise electric vehicles across the multitude of services they provide. They found that 65% of journeys were less than 280 miles and could theoretically be delivered by the current electric vehicle technology, however this does not

² CPT Coach Operator Survey 2023
³ CPT Coach Operator Survey 2023

show the whole story. In a detailed simulation of coach operations conducted across 35,727 days, 12,755 (36%) of these were four days or consecutive days when vehicles were operated away from base and did not return to depot. Therefore, only 45% of the total journeys provided by coach operators can be driven using today's current electric technology, using a model where vehicles are returned to the depot to recharge.

BluMarbl modelled different infrastructure scenarios, to determine what additional range could be delivered. They found that installing opportunity charge points across the strategic road network at both motorway service stations and attractions was able to increase the number of coach services provided by current technology to 75%. However, opportunity charge points are only expected to be used by coach operators during certain times of the day; between 10:00 and 13:00, with an additional peak window for motorway service stations of 15:00 – 17:00, which follows the expected pattern for coach operations with passengers collected first thing in the morning, arriving at their destination several hours later, or stopping for a break, with an additional break on the return journey. For these charge points to be commercially viable, other transport modes would need to access them outside of these peak coach times.



BluMarbl Analysis, 2023

The above graph demonstrates the additional services that can be provided, depending on the charger speed of infrastructure. Services provided by coach operators increase by 38% if megawatt chargers are installed at service stations, and 25% if 150kW chargers are installed.

Coach operators will not be able to transition their services completely and sustainably to zero emission vehicles using depot charging solutions alone, a reliable and comprehensive charging network is going to be key to enabling operators to provide 100% zero emission services.

Additionally, this evidence supports the importance of cross transport mode sharing of infrastructure and further fleet data is required from HGV and Local Authorities to show that they can be utilising these chargers at other times of the day and give certainty to other sectors that infrastructure is in place.

BluMarbl have been a valued member of our Zero Emission Coach Taskforce from the beginning and we would encourage DfT to continue to engage with and support their research which we anticipate will provide a vital, and never captured before, insight into the travel patterns of coach operators.

Hydrogen Infrastructure

Operators who have either installed or looked to install hydrogen refuelling infrastructure at their depots have reported that unless you operate 20 vehicles or more, it is difficult to build a commercial business case. 81% of coach operators are family run or individually owned and 66% of operators have 15 vehicles or less. We therefore anticipate that hydrogen coaches will need to be supported with shared hydrogen refuelling sites.

These would need to be strategically placed across the road network, in the same way as diesel refuelling sites.

Infrastructure Barriers

To operate their fleet confidently and efficiently, operators need depot charging infrastructure as well as a reliable network of charging infrastructure across the strategic road network.

Depot challenges

Ownership – Whilst many coach operators own their depots, there are others who lease their depots, with contracts typically lasting between 3-5 years. These operators would need to get permission to install infrastructure at depot, which would also need to be moveable in the event the coach operator wanted to relocate.

Cost – Installing both electric and hydrogen infrastructure at depot is expensive. For electric infrastructure, operators have been quoted £40,000 for electric cabling, £20,000 per electric charging unit and over £100,000 to reinforce their electricity supply. For hydrogen, we are uncertain of the cost for coach, but we know from bus operators it is estimated around £432,000.



Space limitations - Available space at depot is often limited which can make it difficult to install infrastructure. The space required for hydrogen refuelling infrastructure is dependent on the technology, a liquid refuelling solution would typically require 25mX25m squared for the equipment plus extra for the dispensers and vehicle maneuvering, a gaseous solution would require 1.5 – 2 times more space than liquid.

The space needed for electric coaches is unclear, but we know that electric buses require an additional 25% more space plus extra for maneuvering and we would expect coaches requirements to be similar.

Electric Infrastructure Specific Barriers

Grid capacity - the grid capacity is not equal across all areas of the UK, and many operators could be required to pay large sums of money to upgrade their supply to ensure they can recharge their vehicles. This challenge is even greater for rural operators (61% of operators⁴) whose depots are located further away from grid connections.

Grid connection process - The application process for infrastructure and grid connection is often overly complex and timely due to multiple elements conducted by multiple subcontractors. Operators are required to get cost estimates from DNOs which are only valid for a limited period, however if they also need to apply for planning approval, delays in this process often mean that the quote has expired. When operators reapply, the energy allocated and costed to them could have been reallocated. Streamlining this process is going to be vital to enabling operators to install electric infrastructure at their depots.

Hydrogen Infrastructure Specific Infrastructure Barriers

Certainty of the supply of hydrogen – There is limited supply of hydrogen, and even less green hydrogen. In order for operators to confidently transition to hydrogen vehicles, a strategy which gives certainty over the supply of hydrogen for coaches is needed.

Cost of hydrogen – The cost of hydrogen is currently very high and volatile; operators will require a way to hedge the cost of hydrogen and stabilise the cost.

HSE process for signing off infrastructure – Currently, the HSE are unable to sign off hydrogen infrastructure due to concerns over safety. It is vital that a procedure for the sign off of these infrastructure sites is developed, so that those operators who do invest in a hydrogen refuelling depot solution are not left with stranded assets.



Interoperability

It is important that recharging infrastructure sites are fitted with universal connectors and adopt recognised charging protocols to ensure that all operators, regardless of their vehicle models, can plug in and recharge their vehicle at any recharging site.

Zemo Partnership hosted a workshop in 2021 to identify the trends in the UK bus sector and key issues relating to charging of EV buses.

The group concluded that there were significant challenges with the communication between charger and vehicles when deploying on route charging and identified a need for greater harmonisation of charging standards and protocols between different suppliers of both vehicles and infrastructure. Additionally, chargers and vehicles can be built to the DC CCS 2 standard. However, there currently is not a certification of this equipment, which can cause further interoperability challenges. These issues are expected to cross over into the HDV sector and will have greater impact on operations that are not return to base, which many coach operations are.


We therefore welcome the work DfT are currently carrying out to investigate the need for interoperability standards and encourage them to engage with operators, manufacturers and Zemo Partnership to ensure there is a consistent standard for charging infrastructure across the country that gives all operators the confidence they can charge anywhere on route.

Zemo Partnerships next charging interoperability workshop is scheduled for Q1 2024.

International Considerations

It is vital that part of the interoperability work also looks to ensure there is a consistent standard across the UK as well as internationally. This is not only to ensure that UK coaches visiting other countries know they can confidently refuel or recharge their zero emission vehicles, but also so that visiting coaches from other countries are supported. Coach plays a significant role in supporting the UK's tourism industry, with 23 million visits to tourist attractions and locations made by coach in 2019, contributing £14 billion to the UK economy⁵.

HGVs and Coaches



Despite coach carrying passengers, their operations are more akin to those of HGVs rather than buses. Both coaches and HGVs are heavy vehicles, which are required to transport heavy loads over long distances and they face similar challenges when it comes to decarbonisation. Which therefore provides an opportunity to share infrastructure, where strategically possible.

It is expected that coach operators will need to recharge or refuel during the middle of the day, with HGVs expected to utilise infrastructure during the early morning and later hours of the day. However, further data is needed on both coach and HGV movements to ensure that full utilisation of the infrastructure is achieved. We would encourage DfT to support BluMarbl's work in this area.

We know that the DfT as part of this work are following the Zero Emission HGV and Infrastructure Demonstrator Programme (ZEHID) and the results that are emerging from the recently confirmed demonstrators. Providing funding for zero emission coach trials would enable operators to demonstrate how these vehicles operate in the real world, across their multitude of services and provide further data and evidence on the most strategic locations for recharging and refuelling infrastructure.

Passenger and Driver Facilities

Whilst coaches and HGVs operate similarly, it is vital to recognise they carry very different loads. Any shared infrastructure sites will need to ensure that passengers have safe and accessible drop of and collection points. It is also important that consideration is given to ensuring there are sufficient passenger and driver facilities.

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