Written evidence submitted by Alstom UK & Ireland:
Second National Infrastructure Assessment

This is a submission from Alstom UK & Ireland to the Transport Select Committee in response to a call for evidence on "Second National Infrastructure Assessment".

Alstom have only answered the questions we felt we could provide relevant information for.

1. Introduction

Question 1: Do the nine challenges identified by the Commission cover the most pressing issues that economic infrastructure will face over the next 30 years? If not, what other challenges should the Commission consider?

The nine challenges set by the Commission rightly includes issues like decarbonisation and urban connectivity amongst the key challenges that will affect the development of the country's transport infrastructure.

However, at Alstom, we believe that decarbonising transport specifically should be highlighted as a key infrastructure challenge. With the transport sector being responsible for 27% of the UK's greenhouse gas emissions, urgent action is needed to decarbonise the sector. Within the sector, rail is a small contributor to the overall emissions (1.4%) yet 9.5% of passenger journeys are made by rail.[1] The multimodal interurban transport strategy can deliver decarbonisation, a reduction in congestion and improved air quality through modal shift establishing a better balance across cleaner modes of transport such as rail. To do so, key infrastructure such as rail electrification will be essential.

The rail network could be decarbonised effectively today using a mix of electrification, hydrogen and battery trains, and Alstom can deliver solutions using all three of those technologies. While significantly more electrification of the rail network is required, electrification does not suit all routes as it can be too costly, impractical or may not achieve sufficient carbon reduction due to embedded carbon in the construction. An alternative 'self-powered train' solution is needed. For longer range routes, the answer is hydrogen, for shorter routes, battery trains can extend range beyond electrified sections. Provision of hydrogen for transport purposes sits within one of the challenges identified - new networks will be needed for hydrogen and carbon capture and storage – and further infrastructure across the electricity grid will be required to support electrification and battery charging as the Commission's second challenge to decarbonise the grid is addressed.

The Commission should therefore ensure that solutions to all of its challenges consider related transport-specific issues and the benefits that could accrue from them.

Question 2: What changes to funding policy help address the Commission's nine challenges and what evidence is there to support this? Your response can cover any number of the Commission's challenges.

The Commission's two transport challenges, improved urban mobility and reduced congestion to boost urban productivity and a multimodal interurban transport strategy to support regional growth need to be addressed carefully and in a joined up fashion. Mainline rail infrastructure that provides interurban connectivity is currently owned by Network Rail and investment in it is managed under Control Periods – five-year investment plans that specify renewal and enhancement plans and budgets. As part of the implementation of the

[1] https://dataportal.orr.gov.uk/media/1993/rail-emissions-2020-21.pdf

recommendations of the Williams-Shapps report into the reorganisation of the rail industry, Great British Railways (GBR) is to be established, subsuming Network Rail and various other elements of the rail industry in a new, nationalised rail body. It is crucial that the infrastructure planning being developed now for GBR to take forward in its 30-year strategy is aligned to other transport infrastructure plans if multimodal, interurban transport is to be realised.

The further linkage of electricity decarbonisation and grid connectivity, together with clean hydrogen production to the interurban transport needs of the rail network will help to facilitate change, for example allowing hydrogen suppliers to invest in larger production facilities underpinned by long term predictable off-take of gas due to rail operations. As noted above, pre-pandemic the UK rail network carried 9.5% of passenger journeys with just 1.4% of emissions. The emission-efficiency of rail can improve further but even at today's standards, a modal shift to rail offers significant benefits against road transport.

Improving urban mobility has to be built upon active and mass "green transport" modes to reduce congestion, improve productivity and quality of life in urban areas. Most urban areas in the UK do not have mass transit systems. Leeds is the largest urban area in Europe without a mass transit system. Leeds is within the wider West Yorkshire area covering 2.25 million people and which includes one of the UK's fastest growing cities, Bradford, and this whole area has a gap in green mass transport. Other urban and high population places without a system (and not exhaustively) include: Tees Valley; Hull City Region; Greater Leicester urban area; Coventry; Cambridge & Peterborough Combined Authority area; Stoke; Derby; Doncaster; Luton-Dunstable area; Reading-Wokingham urban area; Greater Brighton City Region; Southampton-Portsmouth urban area; Bournemouth; Christchurch & Poole Local Authority area; Plymouth; Bristol and the West of England Combined Authority area; Cardiff Capital Region; Swansea Bay City Region and Belfast City Region.

In outlining the above areas, it is not to say that there aren't transport gaps elsewhere. For example, there are transport gaps in areas which have systems such as in Greater Manchester and the West Midlands. Equally some of these gaps are set to be addressed through plans that are underway or are being developed to serve more places.

Despite this, the green transport gap contrasts unfavourably with similar countries. Germany has 52 tram systems alone, four times the UK's total mass transit systems and France has 29 tram systems. Another 63 Schemes are not just coming forward in Europe but in Asia, Africa and North and South America too. Over the last decade trams have opened in Algeria, Morocco and Ethiopia and in Asia in Turkey, Uzbekistan and Dubai. New metros are also taking shape including in Vietnam and Ivory Coast. Alstom has a track record across continents and countries developing leading schemes and bringing forward new technologies to secure a range of benefits.

The government recently made a commitment to commencing studies into a possible tram system for Leeds which is to be applauded, should it come to fruition, but there remains a huge challenge to address urban congestion across the UK. The Commission has rightly identified this challenge and needs to ensure that it highlights the opportunities and necessity to address it.

Question 5: What are the main opportunities in terms of governance, policy, regulation and market mechanisms that may help solve any of the Commission's nine challenges for the Next Assessment? What are the main barriers? Your response can cover any number of the Commission's challenges

Alstom supports the Government's ambitions to invest in UK transport infrastructure to level up the country and help to achieve net zero emissions by 2050.

However, we need continued, specific investment in new technologies like hydrogen to make this a reality and remove diesel trains from the network. Alstom is calling on the Government to begin a coordinated investment

programme in UK rail and mass transit systems designed to achieve net zero such as those described in our responses above. This includes electrification, supporting the first hydrogen and battery routes and putting in place a rolling hydrogen programme.

Alstom believes the Government should start initial investment in rail infrastructure and technologies such as hydrogen trains now. It may appear that 2050 is a long way off but the implementation of change of the scale of, for example, the elimination of all diesel traction on the rail network by 2040 as targeted by the GBR Transition Team in its recent consultation, takes time. The benefits of early works accrue between their implementation and 2050 and so payback commences immediately but most crucially, by starting now, we have sufficient capacity to deliver in the long term. Hydrogen rail services could be operational within four years of order, ready for the fourth carbon budget, where much more rapid progress is needed to meet the targets. Investment in this area will stimulate demand for the wider hydrogen economy and will help to drive the timely removal of diesel-powered trains from the UK rail network.

There is also significant demand for hydrogen trains in Scotland, and Wales and North, East and South West England where there are little or far fewer electrified rail networks, on rural routes. The implementation of hydrogen on rail requires infrastructural support away from the railway – hydrogen production can be done on depot, but it is far better to centralise production and distribute supplies to multiple, aggregated users.
The government can play a key role in unlocking one of the nine challenges: "new networks will be needed for hydrogen and carbon capture and storage".[2] Hydrogen is currently expensive as it is not widely used, but if the government were to invest in hydrogen across multiple sectors it would drive down the price and encourage more business investment in hydrogen development and use. New networks, like the hydrogen hub in Tees Valley, are needed across the country to ensure easier access to hydrogen technology.

Funding can be secured from private sector investors for many of the schemes necessary for both interurban and intraurban developments if the government is willing to drive usage and underwrite policy to give long term predictability to usage of the systems. Management of revenue risk is key, as have been seen with the revenue collapse in the rail industry during the pandemic. Measures such as the fuel duty freeze work counter to the achievement of the challenges identified, as does an RPI based fare price escalator for the greenest mode of powered land transport.

Challenge 4: Networks for hydrogen and carbon capture and storage – the Commission will assess the hydrogen and carbon capture and storage required across the economy, and the policy and funding frameworks needed to deliver it over the next 10-30 years.

Question 11: What barriers exist to the long term growth of the hydrogen sector beyond 2030 and how can they be overcome? Are any parts of the value chain (production, storage, transportation) more challenging than others and if so why?

One of the main barriers to long term growth of the hydrogen sector is cost. Until there is a wide range of hydrogen use it will be difficult to drive down cost and make hydrogen an economical solution. The production of green hydrogen is currently the most expensive means of producing hydrogen.

In the rail sector at present, the first steps cost more than continuing to run diesel trains. This has led to investment hesitancy within the Treasury and the Department for Transport. At present there are around 3,700 diesel rail vehicles used on the UK railway network. Of these around 2,400 are regional diesel vehicles, and a conservative estimate is that half could be replaced with hydrogen equivalents. This will help the Government reach its 2040 removal of diesel aims.

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[2] p.4. **https://nic.org.uk/app/uploads/Revised-Second-National-Infrastructure-Assessment-Baseline-Report.pdf**

A way to reduce cost and allow multiple sectors to have access to hydrogen is by having hydrogen hubs. In transport, through return-to-base fleets such as trains but also buses, taxis and HGVs, it is possible to deploy vehicles and fuel generation and storage facilities together, creating hubs and yielding immediate carbon and clean air benefits. This is more efficient and allows hydrogen to be stored away from mass populated areas. The Government needs to create a co-ordinated programme to support the wider hydrogen economy and promote it through national, regional and local powers and remits. The Tees Valley multi-modal hydrogen transport hub, if successful, could be a blueprint for the country in this respect.

Hubs of this type can be created ahead of a national hydrogen distribution network being developed or the gas grid being repurposed, which is achievable, and needed for example to heat homes through hydrogen. With each fleet deployed, a fuelling facility is created, and as fleet numbers increase a larger network of fuel points will develop, in the same way that diesel did 70 years ago. Each fuel facility creates local jobs and skills to build and operate it, spreading hydrogen expertise across the UK. As other uses for hydrogen grow, these transferable skills will form part of a growing UK hydrogen economy and support a green recovery.

As such, the best way to help drive down the cost of hydrogen is to start using it and, as a government, to support the businesses facing the commercial challenge of adoption during this transition stage.

Other barriers include the public perception of hydrogen. It is known to be extremely flammable so messaging on safety is extremely important. While no fuel is 100 percent safe, green hydrogen has been shown to be safer than conventional fuels in a multitude of aspects. Solutions include fitting sensors in hydrogen hubs. Because hydrogen is colourless and odourless, sensors are a requirement for hydrogen fuelling stations, equipment, and facilities. Today's technology enables remote hydrogen sensing to ensure robust detection of any hydrogen leak.

Challenge 9: Interurban transport across modes – the Commission will consider relative priorities and long term investment needs, including the role of new technologies, as part of a strategic multimodal transport plan.

Question 17: What are the barriers to a decision making framework on interurban transport that reflects a balanced approach across different transport modes?

Government investment is one of the main barriers to finding a balanced approach in interurban transport. The recent integrated rail plan revealed this with a scaled back version of Northern Powerhouse Rail with impacts compounded by the reduction in ambition for the eastern leg of HS2. Innovative transport options are often trialled in southern regions and northern communities are left behind with outdated transport options. Decarbonisation is a key example of this, with electrification of the railways taking place around London with the North being left with older diesel trains. The government should use the development of hydrogen to deploy new hydrogen trains to Scotland, Wales and northern English regions to ensure a more balanced approach across the UK, and Alstom stands ready to provide the solutions in this area.

As noted above, the creation of GBR, and its 30-year strategic plans needs to be integrated with a broader, wholistic approach to multimodal transport strategy. No single mode offers a "silver bullet" solution to all of the challenges of creating a net zero transport network, they have to work together in a complimentary fashion, exploiting their relative strengths. Rail is inherently energy efficient, and this key trait must be exploited within any balanced approach to transport.

Government must also recognise the differing levels of feasibility of transport options across the country. In addition, the government needs to work with local authorities to discover what sustainable transport solution would suit particular areas most rather than having a blanket approach. For example in rail, while significantly more electrification of the rail network is required, electrification does not suit all routes as it can be too costly,

impractical or may not achieve sufficient carbon reduction due to embedded carbon in the construction. An alternative 'self-powered train' solution is needed for some areas of the country. There is significant application for hydrogen in Scotland, and Wales and North, East and South West England where there is little or much less electrification and routes can have long, rural and less trafficked sections. Hydrogen also has the additional benefit of not creating large disruptions through construction, causing less impact on passengers whilst delivering on government 'levelling-up' and decarbonisation agendas.

Building a hydrogen network in particular areas can also support regional growth with new green jobs, new suppliers and a larger number of transport sector workers.

When considering the role of new technologies as part of a strategic multimodal transport plan hydrogen should be considered as one the best net-zero options. At Alstom, we believe that the use of hydrogen in early transport deployments is a key step to ensuring a smooth transition into wider hydrogen-powered transport operations in everyday life. As mentioned previously, through return-to-base fleets such as trains but also buses, taxis and HGVs, it is possible to deploy vehicles and fuel generation and storage facilities together, creating hubs and yielding immediate carbon and clean air benefits. This is more efficient and allows hydrogen to be stored away from mass populated areas.

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