EUROPEAN UNION AGENCY FOR RAILWAYS

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OPINION

ERA/OPI/2015-10

OF THE EUROPEAN UNION AGENCY FOR RAILWAYS

FOR

EUROPEAN COMMISSION

REGARDING

REQUEST FOR REVISED OPINION (ERA/OPI/2015-4 OF 15 APRIL 2015) CONCERNING THE PLATFORM HEIGHTS IN THE CASE OF THE HS2 PROJECT IN THE UK

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1 General Context

1.1 The European Commission requested ERA to prepare a revised technical opinion regarding the request from the UK Department for Transport to deviate from the TSI platform heights in the case of the HS2 project in a letter referenced as Ares(2015)5760317 and dated 11 December 2015.

1.2 In detail, the request from the Commission asked that the revised technical opinion indicate in its conclusions whether the use of a platform height, which is different from the TSI target system and the existing UK specific case is justified and the procedures to apply in case its (the new platform height) use would be justified.

1.3 This revised technical opinion needs to be read in conjunction with the original opinion referenced ERA/OPI/2015-4 of 15 April 2015. Following the presentation of this first opinion further discussions were held at meeting 74 of the Railway Interoperability and Safety Committee (RISC) followed by a further meeting between the DG MOVE, ERA and the UK representatives on 11 November 2015.

1.4 The revised technical opinion assesses the key boundary conditions that are raised by the HS2 Project proposal. The HS2 Project proposed a new platform height of c1200 mm above rail level to facilitate level access to the train. This proposal is neither consistent with the TSI specifications (550 mm or 760 mm) nor with the 915 mm Specific Case for the UK network. The proposal, as it is currently presented, would increase the diversity of both the UK and European railway networks.

2 Background

PREVIOUS TECHNICAL OPINION

2.1 The Technical opinion ERA/OPI/2015-4 was issued by the Agency on 15 April 2015 and could find no appropriate mechanism within the European legal framework relating to railways, i.e. the Interoperability directive and the relevant TSIs, to allow the platform height 1200 mm above rail level (arl). This height is not a "target" in the TSIs. Neither did the project fit into a category that would give grounds for a possible derogation.

2.2 In the previous technical opinion we highlighted what seemed to be the three possibilities to allow such a height:

- To create a second specific case for UK (The UK already has a specific case for its 915 mm arl platforms);
- To introduce a third target platform height into the TSI, and
- To declare the proposed 1200 mm arl height as an innovative solution (resulting in a further target for platform height at the next revision of the TSI INF).

2.3 The conclusions of the original Agency opinion were that:

- None of the characteristics of the HS2 project would permit its classification as a specific case;
- Neither were there grounds to give a derogation, and
- Further analysis was required.

This was agreed by the RISC.

HS2 PROJECT

2.4 The proposed High-Speed 2 (HS2) route for the United Kingdom will link London with Birmingham, Manchester and Leeds as well as other cities in the north and Scotland progressively after 2026 according to current plans. The first phase will be 192 kilometres in length and the second phase will add a further 348 kilometres of route on two arms. The HS2 Project Team are currently seeking the legal powers to enable this to happen from the UK Parliament via an outline reference design. This indicates, at the strategic level, the proposed centre line of the works. At the Reference level an indication of the design is plotted onto maps showing the current geography of the areas through which the proposed line would pass.

2.5 Individuals and organisations affected by the route and with an agreed locus are able to object to the Select Committees of the Parliament dealing with the application for those powers. At the present time the House of Commons Select Committee has completed its investigation hearings from objectors and the amended Bill will go forwards to the House of Lords Select Committee in the near future.

2.6 In this revised Technical Opinion our further analyses noted that the Development Agreement between the (UK) Secretary of State for Transport (SoS) as the SoS and High Speed Two (HS2) Limited as HS2 Ltd relating to the High Speed Two Project, 8 December 2014 requested that HS2 Ltd should, in respect of the following priorities, use its best endeavours to achieve all the objectives set out in the Sponsor's Requirements Objectives:

7. Passenger experience:

The Railway shall provide a good quality passenger experience, which meets the reasonable expectations of all groups of travellers for customer service, accessibility, comfort and passenger facilities.

This includes but is not limited to:

- *simple to use and accessible to all passengers including people within reduced mobility;*
- *provides reliable and helpful real-time passenger information in an appropriate range of formats;*
- *provides for smart ticketing and convenient ticket retail;*
- *enables passengers to reliably access communication networks in a way that meets their reasonable needs and expectations for entertainment, personal or business usage;*
- *is attractive, comfortable and pleasant to use;*
- *provides appropriate numbers of toilets on trains and at stations; and*
- *provides appropriate luggage storage and catering facilities.*

8. Revenue:

- *The Railway shall operate efficiently to earn commercial revenue from passengers. Design should retain flexibility for developments in the commercial, customer and operational models.*

10. Integration with the Existing Network:

- *The Railway shall be capable of operating passenger services that seamlessly operate on both the high-speed network and Existing Network where required.*

17. Compliance with standards:

- *The Railway shall comply with all applicable UK and European railway standards and legislation including the EU Technical Specifications for Interoperability ("TSIs") and Notified National Technical Rules. HS2 Ltd may only seek a derogation or change to a TSI because of a conflict with national specific cases, with the agreement of the SoS.*

VIEWS EXPRESSED AT THE 74th MEETING OF THE RISC

2.7 At the 74th meeting of RISC the UK presented its request for an innovative solution (Article 10 of the TSI INF) to be granted for a new high-speed line where the platform heights would be different (~1200 mm arl) from those foreseen in the TSI, in order to facilitate "level boarding" for PRM. ERAs Head of Interoperability (Anna Gigantino) commented that the Agency had received all documentation for this case and ERA had issued a technical opinion. It was difficult to see how it would be legally possible to have a derogation to the TSI, as the UK already has a specific case for a different height (915 mm arl) for its platforms. ERA's concern was that this line might not allow connection to the rest of the UK and EU network, yet the line is clearly shown as part of the core network on the map. There should be no exclusion limiting its connection to the rest of the network in the future. ERA believes that this is not the only solution that might be adopted to achieve level boarding. The idea to have a platform height at ~1200 mm arl could be a disadvantage in the future, should interconnection with the rest of the UK and EU rail networks take place. ERA's technical opinion applied the precautionary principle where there is a danger to interoperability and asked for a further study. ERA also asked the Commission to publish the opinion.

2.8 The RISC 74 minutes state that Luxembourg supported the UK and proposed to review the INF TSI to better overcome the competition with the long distance bus lines (that have easier boarding possibilities) while France suggested the use of Article 9(1)b of Interoperability Directive to ask for a derogation, rather than Article 10. The representative from Switzerland commented that it has level boarding with platform height of 550 mm and suggested a review of all TSIs in this sense. It was commented that railways in Switzerland have provisions for level access restricted to one door per train for a wheelchair. This is a level boarding access at the 550 mm arl platform height.

2.9 The minutes also noted that Italy suggested that to realise level boarding, new rolling stock should be adapted to the standard platform heights foreseen in the TSIs rather than the opposite, as the "HS2" is a new line anyway.

2.10 The UK asserted the fact that rolling stock with distributed traction needs floor height of about 1200 mm. It thanked Luxembourg for its support and commented on the suggestions from Switzerland and Italy. The UK wanted to have the accessibility for all the train and not just one coach and a "standard" train, not to create a special one.

2.11 DG MOVE commented that as there were many different questions to be assessed it concluded that further discussion was needed between DG MOVE, ERA and UK before proposing something.

2.12 Following further consideration of these outcomes the UK Department for Transport Rail Executive wrote to The European Commission DG MOVE asking:

" the Commission to consider possible ways to enable the UK to build HS2 platforms at a higher height, circa 1200 mm rather than 550 mm, 760 mm or 915 mm. UK officials and HS2 Ltd recently met with ERA to discuss the issue and they suggested possible solutions but advised we should raise the issue with the Commission. It is important that a solution is found and this might involve one of the following options:

- *seeking an amendment to the new Infrastructure TSI after publication;*
- *adding an additional new specific case for the UK to the TSI; or*

- *agreement that an innovative solution could be introduced within the UK for the TSI pending a future change to the text but enabling a number of platforms in the UK to be designed and built at the higher height in the meantime."*

2.13 The UK requested that the Commission call upon *"ERA to provide a technical opinion about this issue."*

2.14 As noted in section 1, on 11 December 2015 the Commission requested ERA to prepare a revised technical opinion.

FURTHER CONSULTATION WITH STAKEHOLDERS

2.15 ERA again consulted stakeholders, this time more widely and in more depth and detail. The Agency also held information meetings with the safety and regulatory bodies that could be impacted by the inclusion of a third platform height in the target system. All of these stakeholders were presented with the following two strategic questions:

- What are the implications for HS2 if a high platform is not provided?
- What are the implications for the Single European Railway Area if a high platform is allowed?

2.16 These questions were the result of the agreement between the UK, European Commission and European Railway Agency at the meeting on the 11 December 2015.

2.17 In detail, face-to-face meetings were organized with:

- the HS2 rolling stock team and representatives of the DfT Sponsor team on 18 January 2016 held in Lille (FR). This meeting was then followed-up by a series of e-mail exchanges to clarify detailed points of concern or to confirm statements given by HS2;
- the Association of European Railway Industries (UNIFE) on 17 February 2016 held in Bruxelles (BE). UNIFE represents the railway manufacturing industry. At the meeting were representatives of a number of different suppliers with a capabilities in the manufacture and maintenance of rolling stock operated at high speeds;
- the Community of European Railway and Infrastructure Companies (CER) on 8 March 2016 held in Bruxelles (BE);
- the European Disability Forum (EDF) and the AGE Platform Europe (AGE) on 17 March 2016 also held in Bruxelles (BE) representing the wide range of passengers with reduced mobility across Europe;
- London TravelWatch on 25 April 2016 held in London (UK). London TravelWatch is the Passenger Rights body covering London. As there are two proposed stations in London on HS2 and as they had given testimony to the Parliamentary Select Committee on this topic, they were consulted, and
- Alstom Transport on 31 August 2016 held in St. Ouen (FR) to better understand to proposed HS2 concept train. The background to this meeting is discussed further below.

2.18 A detailed set of questions were issued to all of the consulted bodies further detailing the issues related to each of the questions.

2.19 In addition e-mails were exchanged between the Agency and the following representative or other bodies:

- EPPTOLA representing six major rolling stock leasing companies;
- EIM representing the European Rail Infrastructure Managers, and
- Transport Focus (UK Passenger Rights body covering the rest of the UK apart from London upon the advice of the European Passenger Federation).

2.20 Additionally, two letters were received by the Commission, but copied to the Agency, from Lord Tony Berkeley, a member of the UK House of Lords, where he speaks on railway matters.

2.21 Also two meetings for "understanding" and "detailed information" on UK standards and legislation were held with the following UK Railway Safety and Regulatory bodies:

- Rail Safety and Standards Board on 25 April 2016 held in London (UK), and
- Office of Rail and Road on 26 July 2016.

2.22 Sections 3.3 and 3.4, below, of this opinion are dedicated to answering the two questions set out in section 2.15 above. They respectively set out the positions the stakeholders expressed on these two questions

3 Analysis

3.1 Introduction

Our analysis, as well as consulting with representative and other bodies, looked at the boundary conditions for the platform / train interface in both the UK and Europe.

In order to formulate this revised opinion we again consulted more widely with parties that we knew would have a position, because they had expressed it before, or we were made aware that a body wished to express an opinion or because the topic had been or was being researched. Here we present the analysis of those findings.

3.1.1 Boundary Conditions

In order to form an opinion on the relative merits and trade-offs between different possibilities of platform height and vehicle design it is helpful to look at the boundary conditions and constraints: In the UK the standard platform height, documented in the TSI as a specific case for the UK, is 915 mm arl and many older platforms are lower and some slightly higher. This is linked to the UK's narrower and differently shaped loading gauge. Unlike on the European mainland, footsteps may oversail the platform (see Figure 1) and passengers make a step upward to get onto the train. However, the high-speed railway line, HS1, between London and the Channel Tunnel has platforms height complying with the target value of the INF TSI of 760 mm arl. In order not to intrude on the swept envelope of passing trains (including their oversailing footsteps) a higher level is only possible on platforms dedicated to particular rolling stock where all trains stop. Heathrow express is the only UK mainline example of this. On the European mainland, with the wider and differently shaped loading gauges, platform heights of 550 mm and 760mm are specified in the TSI. These are two common heights "inherited" from an international agreement by Ministers for Transport back in the 1990's. There is no "science" behind this choice only history.

Figure 1.Oversailing footsteps at a UK 915 mm arl platform (© ERA/Ernest Godward)

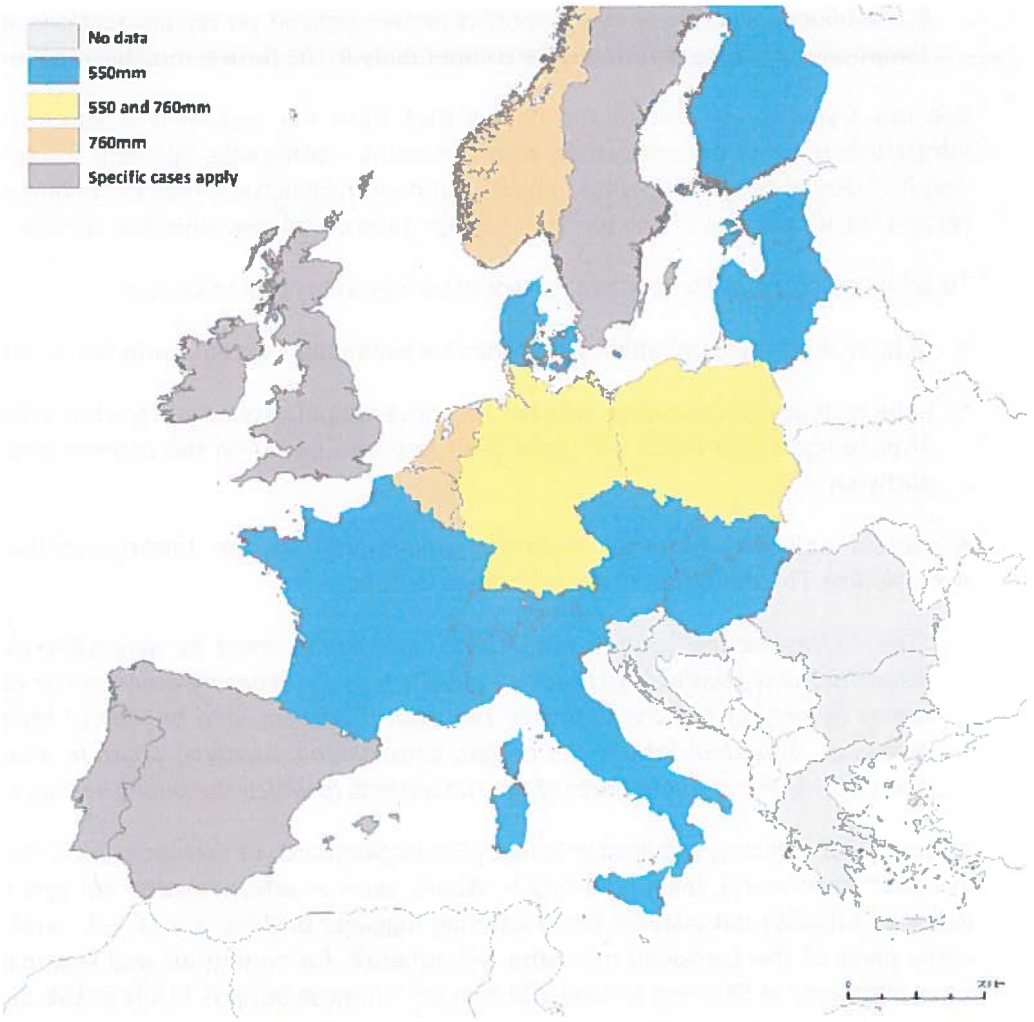

Figure 2.The general situation regarding platform heights in the EU28 plus Norway and Switzerland.

Figure 2 above shows the application of the EU standard heights for new construction; Blue = 550 mm arl, Light Orange = 760 mm arl, Yellow = both, dark grey = New builds in other heights than the EU standards

There is normally always a horizontal gap between doorway sill, lowest step and platform. In some cases where unassisted boarding is possible some form of retractable bridge at floor height may be deployed.

Unassisted boarding is not at the moment an explicit objective in either the RSSB's Platform-Train Interface Strategy or the TSI's.

3.1.2 Discussion of boundary conditions

This section seeks to outline the objectives, priorities and possibilities that may be taken into account in selecting a platform height for HS2 stations.

One objective (an essential requirement in the Interoperability Directive) is ***Technical Compatibility***. The definition of Technical Compatibility is as follows:-

> *"The technical characteristics of the infrastructure and fixed installations must be compatible with each other and with those of the trains to be used on the rail system. This requirement includes the safe integration of the vehicle's sub-systems with the infrastructure.*

If compliance with these characteristics proves difficult on certain sections of the network, temporary solutions, which ensure compatibility in the future, may be implemented."

Because trains move around the routes that form the system it is essential that railway infrastructure must be compatible with the trains – otherwise different infrastructure might "export" design constraints onto vehicles. Some infrastructures may be incompatible and may restrict the movement of any particular design type of railway vehicle to specific routes.

To achieve Technical Compatibility it would be logical for HS2 to choose:

- to be technically Compatible with other European high-speed routes (as is HS1), or
- to be technically compatible with the UK conventional network-on the basis that the majority of passengers and trains will make their journeys partly on the conventional network and partly on HS2.

A second objective (also an essential requirement in the Interoperability Directive) is ***Accessibility***. The definition of Accessibility is as follows:-

"The "infrastructure" and "rolling stock" subsystems must be accessible to persons with disabilities and persons with reduced mobility in order to ensure access on an equal basis with others by way of the prevention or removal of barriers, and by way of other appropriate measures. This shall include the design, construction, renewal, upgrade, maintenance and operation of the relevant parts of the subsystems to which the public has access."

Although not explicitly required in Railway Group Standards or TSIs (no vehicle floor height is set in either framework), level boarding is usually seen as advantageous not just for Persons of Reduced Mobility but also for those carrying luggage, pushing prams, etc., and is achieved in many parts of the European mainland rail network, for commuter and regional applications, from platforms at 550 mm arl and 760 mm arl. In most designs this is at the expense of level access throughout the train because the floor needs to be higher than 550 or 760 mm over the bogies. Train manufacturers have also recently produced designs with ramps over the bogie areas that comply with the specifications set out in the PRM TSI.

On the main lines in the UK, level boarding is not easy because of the traditional "oversail" of footsteps above the platform that ensure a very small and possibly negative horizontal clearance "gap" by maintaining a vertical clearance. Passengers negotiate a single step up from 915 mm to a floor height of around 1100 mm -normally with a very small sometimes negative (oversail) horizontal gap footstep-platform.

On the European mainland, where level boarding is provided (i.e. mostly for commuter and regional applications, exceptionally for high-speed applications with a very specific train), the floor, footstep or retractable step pad (if any) and platform are all the same height so effectively only one level, which is very small (certainly less than 5mm), height differential need to be negotiated and the passenger focusses on stepping across the horizontal gap.

For the UK conventional network it might be possible to achieve level boarding continental style. It should be noted, however, that such a development might affect vehicle width. The sway of the kinematic envelope at 915 mm arl would be higher than at 760 mm or 550 mm arl so the horizontal gap would need to be correspondingly wider.

In the vast majority of European high-speed applications, however, level boarding has not normally been provided. Wheelchair users are assisted to board and alight from the trains. Level boarding is not a regulatory requirement but many initiatives are being developed by train manufacturers and railway undertakings to improve the boarding of wheelchair users, such as on-board aids or dedicated wheelchair access doors giving level access to a low-floor area of the train.

A third objective is ***Dwell time*** (which is not an essential requirement in the Interoperability Directive)

Normally for long distance trains dwell time is not an issue with 1 to 4 minutes being allowed. In the case of HS2, contrary to this, dwell time is stated to be a key requirement for the fulfilment of the business case. Principle drivers of dwell time are:

Door, vestibule and aisle width:

- Normally InterCity and high-speed trains have doors at the end of the carriage accessed through a vestibule at the end of the passenger compartment. The door from the vestibule to the passenger compartment is normally only wide enough for single file movement out of or in to the passenger compartment and like in airplanes tends to be further slowed down by passengers blocking aisles whilst they take or put their luggage into the overhead racks. Only single file movement may take place at only one or two doorways.

- For commuter trains – to keep down dwell times to say 90 seconds for a half load entry/exit at least 2 wide sets of double doors opening into the passenger compartment are provided and space is clear around the doorways and into the passenger compartment. There is no real aisle. At any moment, approximately 6 to 8 people can board or alight through the space available.

Luggage storage:

- Many InterCity Trains have luggage racks in the end vestibules at the opposite side to the access to the passenger compartment. People moving luggage from these racks to and from the platform conflict with passengers moving directly between the passenger compartment and external doors and prevent even single file speed of boarding/alighting.

Finding the seat

- A seat reservation is generally necessary in InterCity and high-speed trains. Looking for the reserved seat is a factor that reduces the speed of passengers in the corridor or aisle.

Steps to/from the platform:

- Passengers can easily negotiate a single change in height floor to platform as normally achieved with UK's 915mm and carriage floors of around 1100mm but where more than one change in height is required (e.g. steps down to a 550mm platform from a 1100mm floor) then boarding and alighting are significantly slowed down, especially if there is also a luggage storage area in the vestibule. In this case luggage transfer usually involves passing luggage down to the platform in a separate act from stepping onto or off the train.

Finally, in the case of HS2, there is a fourth objective, although not specifically addressed in presentations, that is ***the level access throughout the train.***

That aspect was discussed and mentioned in the summary of the market soundings that HS2 had undertaken with manufacturers.

Clearly, level access throughout the train may have benefits, e.g. from observation, after a station stop during the first few minutes after the start it is normal to see passenger who having joined the train at the last second by the most convenient door walk through the train to find their seat. Observation also shows (Figure 3), however, that this flow of passengers throughout the train can be better addressed by the use of devices (e.g. active and passive displays on the platform and within the train (not shown).) that give intending passengers the information needed to get to the seats. The objective, stated by HS2, of having level access throughout the train is not normally something other railway systems give high priority to.

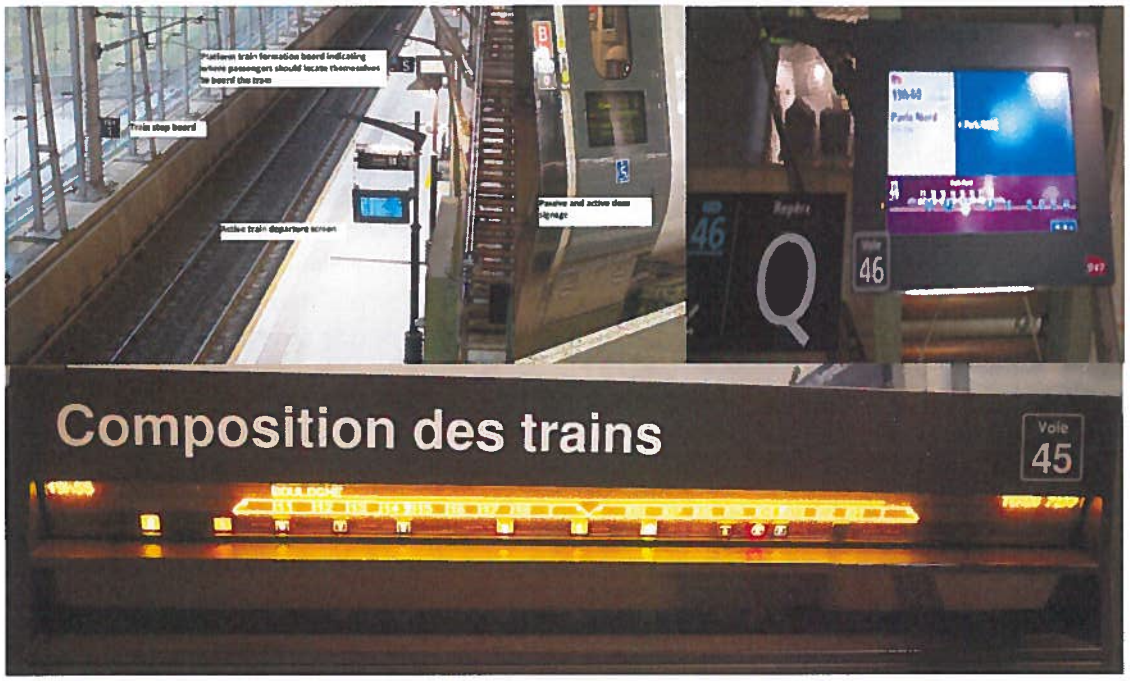

Figure 3. Examples of Passive and Active signage on platforms and on the exterior of trains to assist passengers in finding their locations within the train. (© ERA/all Ernest Godward)

In the case of HS2, it may not be an objective *per se* but a combination of the level access to all doors and of the distributed traction (requiring volume for equipment at the underframe). This is given a high priority and this priority then translates into the requirement for a ~1200 mm arl floor height throughout the full length of the train.

3.2 Specificities of HS2

The HS2 project has a number of specificities:-

- The proposed HS2 Route is part of the European Core railway network as set out in Regulation 1315/2013/EU.[1]

- Under the current proposal the HS2 infrastructure will provide a complement to the current, congested, West Coast Main Line (WCML). Under the proposals developed by the UK Department for Transport and HS2 Limited the new line was intended to be an integral part of the UK and European Railway system. In terms of the rolling stock, it has been proposed that some trains would be dedicated to the HS2 route, i.e. "captive" trains only serving HS2 stations. It is proposed that these stations would be built with the new platform height. It is also proposed that trains would use HS2 infrastructure and then serve current UK network stations away from HS2. It was explained that there would be a separate fleet of trains that would be able to use both the high platform HS2 stations and the existing UK (915 mm arl) platforms. In the first phase of HS2 some 60% of services would go off the HS2 infrastructure and in the second phase more than 45% of services. The Agency has estimated that about 55% of the passenger demand for train services would originate from stations off the HS2 network during the first phase of the project based upon evidence provided to the UK House of Lords Economic Affairs Committee during its enquiry into the Economic case for HS2[2]. In the second phase, the numbers originating from stations off the HS2 network will be less they could feasibly constitute up to 30% of the demand. The reason for the decision to have two fleets, one of which is "bespoke" or "non-standard" compared with the rest of the UK rolling stock fleet, and the benefits of such a decision generating a specific vehicle design for the route is not clear. It certainly raises issues of UK interoperability, access for other operators, and residual value risks for the financing of the rolling stock.

- The requirement for level access throughout the train appears to override all other priorities and means that only trains with floors between 1100 – 1250 mm are possible for HS2 services. This was asserted by HS2 in their presentation to the Agency on 18th January 2016. The Agency feels this requirement has the following consequences:

    - The current designs of high-speed double-deck trains cannot operate on the HS2 infrastructure with a high platform. Whilst on the one hand it appears that double decker's could imply longer boarding time they often have wide doors and level access to keep dwell time the same as single decker's. Observation, albeit on a very small sample, shows dwell times for double deckers to be less than or similar to that of single decker high-speed trains for similar loads. With capacity per unit of train length approximately 40% greater than a single decker means that if services were provided by double decker's there would be up to 40% fewer train paths required or the route could deliver up to 40% more capacity. We could not see that there were good reasons for HS2 depriving themselves of this future extra capacity. It is also clear from recent news stories that "concept" TSI compliant double-deck trains designed to meet UK requirements[3] are possible, but *"...not yet accepted by Network Rail and the UK government..."*, as the article states.

- Level boarding will not be possible when these trains run on the rest of the UK network – a step from 1200 mm to 915 mm is clearly not level boarding. Level access throughout the train plus level boarding at HS2 owned stations "exports" non-level boarding to every stop such trains might make off the dedicated HS2 infrastructure.

- A platform height of 915mm for HS2 stations combined with relaxation of the requirement for level access throughout the train would, for example, allow level boarding throughout the whole of the UK. In the paragraphs above we have estimated, based on UK Government evidence, that during the first phase about 55% of demand will come from off-HS2 stations. This might be expected to fall to between 25 – 30% after the completion of phase 2. In our understanding the UK passengers' best interests are better served by level access to the train, i.e. at 915 mm arl rather than throughout the trains, i.e. at ~1200 mm arl. HS2 has opted for a high frequency service and a small number of platforms at intermediate stations, e.g. Old Oak Common, Birmingham Interchange, East Midlands Interchange, etc... As a result "metro-style" dwell times will be required. This has the following implications:

    - this will lead to a very novel approach to current high-speed railway vehicle design. The implications of a "metro-style" interior layout will require wide doors in the passenger compartments opening directly onto the platforms and the elimination of the aisles found in normal UK inter-city vehicles;

    - How to deal with the luggage issue will also need careful consideration. At busy periods it is inevitable that HS2 services will face a volume of luggage to be moved by the passengers far in excess of that seen on a busy metro style service;

    - How to deal with the numbering of the seats will be another issue. Unlike in metro or commuter trains, passengers will not direct themselves to the first available seat but will have to find the one they have booked;

    - Inter-city passengers are also not as familiar with the experience of boarding and alighting as commuters. They are therefore likely to be significantly less efficient than metro passengers at executing this task quickly, and

    - The ~1200 mm floor height, that prevent the use of double decker's, exacerbates the challenge as it drives up the number of train paths to be accommodated through intermediate stations such as Old Oak Common.

  We are not convinced that the challenge of limited space for platforms at intermediate stations such as Old Oak Common is best solved by exporting constraints to the design of trains and passenger behaviour by means of ambitious specifications for dwell times.

  While interoperability with the rest of the EU might not be the highest priority, interoperability with the rest of the UK railway system certainly remains an important, if not critical, issue to the commercial success of HS2. If platform heights at Euston and Old Oak Common are ~1200 mm and dwell time is critical, then there will inevitably be a bias against allowing access to trains with floor height that are not ~1200 mm arl.

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[1] REGULATION (EU) No 1315/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU see: http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32013R1315&from=FR

[2] The estimate is based upon HS2 evidence given to the House of Lords Economic Affairs Committee investigation: The Economics of HS2 by the UK Government.
See Figure 2.11 at: http://www.parliament.uk/documents/lords-committees/economic-affairs/Economic-case-for-HS2/House%20of%20Lords%20Econimic%20Affairs%20Committee%20The%20Economics%20of%20HS2%20-Government%20Response.pdf

[3] Pack, H., and Plomer, J., A Seat for everyone: The Double-deck D-DART Train. Modern Railways February 2017, pp57 - 61

HS2 have not made it clear exactly what penalties may be exported to non 1200 mm arl floor trains but certainly if dwell times are critical at intermediate stations such as Old Oak Common and level boarding is critical to dwell time, as argued by HS2, then it follows that trains that cannot achieve the dwell time either because they do not have level boarding or more broadly because they do not have a design configuration that gives the 2 minute dwell time will be not allowed on grounds of Technical Compatibility or Capacity or penalised by extra access charges. The HS2 operator/concessionaire will have either exclusive access or a market advantage compared to any competition. Passengers will not only be faced with the challenges of a monopoly supplier but also the possibility for through services both to the rest of the UK and/or the continent will be restricted to one operator with one design of trains.

3.3 What are the implications for HS2 if a high platform is not provided?

There are currently two target heights for platforms that have been agreed in the TSIs – 550 mm and 760 mm arl. In addition the TSIs contain a number of specific cases related to platform heights. The UK has a specific case for a platform height of 915 mm arl. Figure 2, shown above, highlights the general situation across EU28 plus Norway and Switzerland.

The origin of these target values dates back to 1990, with a Resolution adopted by the European Conference of Ministers of Transport (ECMT). This Resolution recommended to draw up, in conjunction with UIC, accessibility guidelines. An expert working group with representation from UIC and ECMT was set up to begin to implement this recommendation and, in its thirty-ninth report from 1992, the ECMT endorsed the values of 550 mm and 760 mm arl about to be adopted as standards by the UIC[4].

For the UK there is a permanent specific case for 915 mm platform height in the Infrastructure TSI[5]. For new and upgraded platforms the UK standard (GIRT 7016) states "*...the height at the edge of the platform shall be 915 mm (within a tolerance of +0, -25 mm)...*". In order to access trains passengers have to step up to the train from the station platform (this can be a single step to a level train interior or two steps to a footboard step and then a small step to a level train interior(Figure 4)).

Figure 4. UK typical "one step boarding" from specific case platform height 915 mm arl observed at Doncaster railway station (© ERA/Ernest Godward)

[4]European Conference of the Ministers of Transport. 39th Annual Report – 1992. Activities of the Conference. Resolutions of the Council of the Ministers of Transport and reports approved in 1992. See the commentary at pages 192 – 195 of this report. The report can be found at: http://www.oecd-ilibrary.org/transport/activities-of-the-conference-resolutions-of-the-council-of-ministers-of-transport-and-reports-approved-in-1992_ecmt_conf-1992-en

[5]COMMISSION REGULATION (EU) No 1299/2014 of 18 November 2014. TSI Infrastructure, Appendix Q which in turn references Notified National Technical Rule GI/RT 7016 Interface between Station Platforms, Track and Trains. See: http://www.era.europa.eu/Document-Register/Pages/INF-TSI.aspx and http://www.rssb.co.uk/rgs/standards/GIRT7016%20Iss%201.pdf

To meet the requirements for passengers with reduced mobility trains and stations are provided with easily deployed manually operated ramps. Figure 5 below illustrates such a ramp used for boarding and alighting from 915 mm arl platforms.

Figure 5. UK PRM boarding ramp from specific case platform height 915 mm arl observed at Doncaster railway station (© ERA/Ernest Godward)

In addition to the standard, the UK Railway Safety and Standards Board (RSSB) issued guidance on the matter in conjunction with implementation of the TSIs including the achievement of level access and "universal self-boarding" .

The RSSB have undertaken significant research concerning the Platform Train Interface (PTI). They note that "... lines that make up the current GB mainline railway are many decades old and were built at different times, by different private railway companies, to different design standards. Much of the station infrastructure (including platforms) does not conform to current standards. There is no retrospective requirement to bring assets into conformity, and doing so is prohibitively expensive."[6]

The report noted that only around 30% of the existing platforms conform to current height standards, and around 20% conform for lateral offset. Only 7% conform to modern standards for both height and offset. The report illustrated the compliance to the current standards. This is shown in Figure 6 below.

[6]RSSB. Platform train interface strategy. January 2015. See: http://www.rssb.co.uk/improving-industry-performance/platform-train-interface

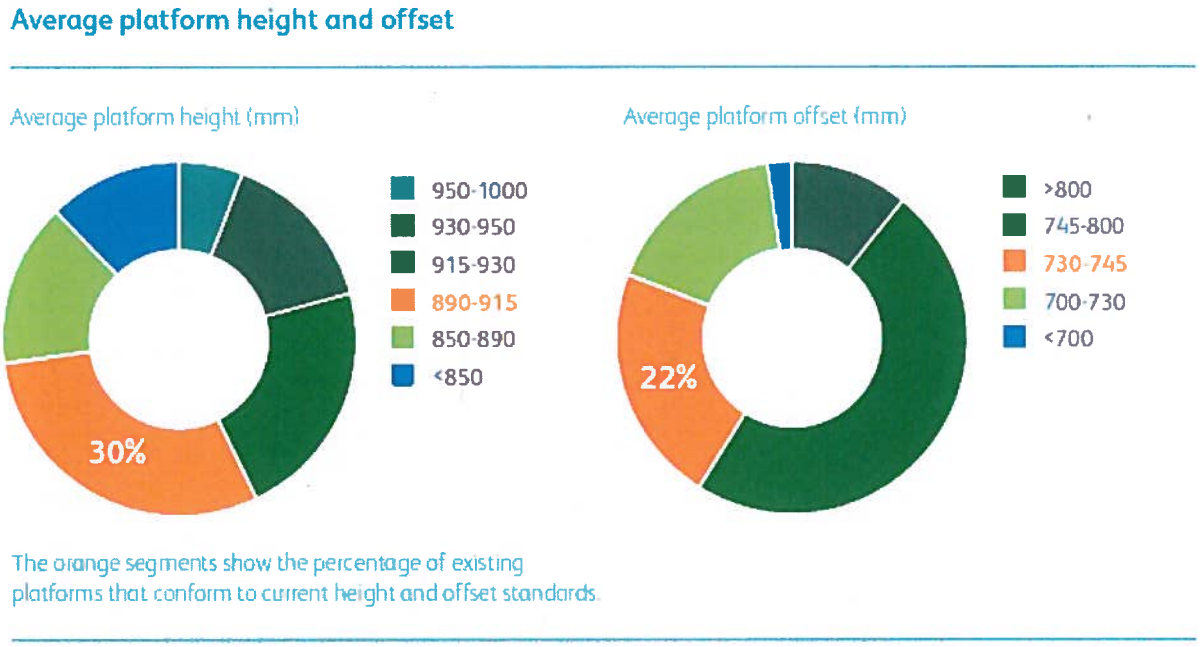

Figure 6. UK average platform height and offset (Source: RSSB Platform train interface strategy)

Given the wide variation in UK platform heights, it will be some significant time before the majority of stations comply with the UK Railway Group Standards or the TSI Specific Case. Clearly, all new stations built, must do so, as must those stations that are modernized. In order to provide accessibility under the PRM TSI ramps may be provided on trains and at stations or other solutions adopted.

The RSSB Platform Train Interface strategy highlighted the further significant diversity regarding vehicle footstep heights: "Train vehicle footstep heights and positions are similarly variable due to their historical introduction, with earlier rolling stock often tailored to specific routes, whilst more modern stock is specified and designed to 'go anywhere', to meet the requirements of today's railway. This diversity is a significant part of the challenge of managing the Platform Train Interface".

The aim of RSSB's PTI strategy is to improve the safety at the platform train interface while optimising "...operational performance, capacity, right of access for train operation (including freight services), accessibility, public behaviour, and perception." in the longer term.

The UK has been at the forefront of improving access to its railway stations particularly for passengers with reduced mobility, e.g. through the development of its Stations made Easy[7] tool that is incorporated within the National Rail website. This allows passengers to understand the layout of the stations being used, the accessibility conditions for train boarding and alighting and whether or not "step free" access to station platforms exists. For train boarding and alighting, the ideal situation is seen as "level boarding" or "near level boarding" (that is to say with a height and offset distance of 50mm or less between the train and the platform).

In the UK unassisted access is achieved on the London Underground system by having level access – in new stations along the whole length and in old stations by having a raised platform adjacent to a designated carriage. This has also been tried on the national rail network (NRN) in a number of locations, though is not universal.

[7]See the example link: http://www.nationalrail.co.uk/stations/sjp/DON/stationOverview.xhtml

At the present time in the UK there are only two main line railway services that offers "near" level access. These are the Heathrow Express and Heathrow Connect services that link London Paddington with rail stations for the airport's terminals 2 and 3, 4 and 5 (three stations T23, T4 and T5). Platforms at these stations are 1100 mm arl[8]. The situation on this particular route and its dedicated services, Heathrow Express and Heathrow Connect, pre-date the development of any of the TSIs but are capable of UK interoperability.

Heathrow Express achieves level boarding at 1100 mm arl but this is facilitated by the fact that all trains stop at all stations so the horizontal clearance can be reduced compared to the normal UK clearances that take account of the swept envelope of moving trains (including freight). Nevertheless, there have been problems with people misjudging the stepping distance, so platform extensions (see Figure 7 below) have now been provided. The misjudgement created a tripping hazard on the Heathrow services.

On visual analysis, the Heathrow tripping problem seems however to be a combination of level boarding and the UK practice of having plug doors and a step-board just a little lower than the carriage floor so that plug doors can have bottom support/runners below the floor. This means that the passenger has to navigate three levels platform height, footstep and step-board height and floor height. The short step between the carriage floor and the step-board forms a tripping hazard.

Figure 7. "Near" level boarding at 1100 mm arl provided by the Heathrow Express at London Paddington station. (Both © Ernest Godward/ERA 2014 & 2016)

When the new Channel Tunnel Rail Link was designed (mid 1990's) and built (2003 / 2007 and now called HS1) the 760 mm arl platform height was used for the platforms served by international trains (London St Pancras, Ebbsfleet International and Ashford International). This route was designed in accordance with the current standards adopted at that time. The other station on the HS1 route, Stratford, also has platforms at 760 mm arl but the international trains do not stop there currently. For the domestic high-speed services (provided by the South East Trains franchise) the platform height used is 915 mm arl. Separate domestic platforms at the 915 mm arl height are provided.

[8]See the Heathrow Express Network Statement, page 15. This can be accessed at: http://www.heathrow.com/file_source/Company/Static/PDF/Companynewsandinformation/rail-network-statement-june15.pdf

The Network Statement states "The platform edge clearances are subject to derogation from the NR standard to minimise the gap between platform and train step-boards with a height of 1100mm. Platform gap fillers are being installed as part of a programme of works during 2015 to reduce the risk of passenger accidents. This will impact the platform train interface when introducing other services."

The high-speed international train services using HS1 (provided by Eurostar International Limited - EIL) do not currently provide level boarding. For passengers with reduced mobility and particularly those in wheelchairs boarding aids are used to gain access to the trains (see Figure 8). These are situated at the stations served by the EIL services and require station and train staff to deploy and use.

Figure 8. HS1 boarding aid being prepared for use on EIL Class 373 train at London St Pancras station. Platform height complies with the TSI 760 mm arl target. (© ERA/Ernest Godward)

The more recent rolling stock now entering service for EIL (Class 374) are fitted with a lift on the train. Figure 9 shows the lift in its deployed position. This is not a completely self-boarding device as it requires assistance from the train crew to operate (in its stowed position it requires a Bern key to unlock it for example). The crew also require some training in its use.

Figure 9. EIL Class 374 train boarding aid in the deployed position at London St Pancras station – platform height 760 mm arl. (Courtesy and ©Eurostar International Limited)

The device also takes some time to deploy and restore and so at EIL's core stations (London, Brussels, Paris, Lille, Ebbsfleet and Ashford) they will continue to use the platform based ramps. EIL have indicated that it may, however, prove useful as they further develop routes, or were they to operate class 374 trains to locations where such ramps were not readily available.

The lift itself is supplied to Siemens by MBB Palfinger and is similar to those fitted to DB Class 407 trains and to ÖBB's Railjet trains which were also manufactured by Siemens.

At the very end of the technical opinion investigation, following the Innotrans Exhibition in Berlin, two other solutions to the problems of providing level access at the TSI platform heights were noted based upon new rolling stock products.

Figure 10 left. Current fixed steps (© ERA/Ernest Godward) for access to Alstom Duplex trains at platform heights of 550mm arl.

Figure 11 right. New design for access to Alstom Duplex trains at platform heights of 550mm arl which has moveable internal steps allowing level access and internal access (©David Haydock)

These were for level access to Alstom designed double-deck trains at 550mm arl platforms. Figure 10 and Figure 11 above show that the particular solution overcomes the problem of the steps down to the lower deck seen in the existing design. The fixed internal steps are replaced by moveable internal floors and steps that can be operated to provide level access. The second solution was seen in a design from Stadler where level access would be achieved at 760 mm arl. This is discussed and illustrated further in the response received from Lord Tony Berkeley below.

3.3.1 HS2 position

HS2 have indicated that without level boarding, the dwell times in stations will impact upon the running of the service. This in turn will impact upon the overall business case for the route.

HS2 set out the case for the route in their presentation to ERA on the 18th January 2016 in the following terms. The HS2 route and train services would offer:

a. High capacity: 18 trains per hour (tph);

b. Reduced journey times: due to a speed of up to 360 km/h, and

c. Integration of new and existing infrastructure to achieve end-to-end journeys. It should be noted that this is slightly at odds with the Development agreement, already referred to above, that indicated that during Phase 1 of the project there would only be 11 tph (target delivery date: 31st December 2026) and that it would be 18 tph when the second phase of the project was operational (target delivery date 31st December 2032).

d. In the presentation given to ERA by HS2 Ltd they state that the Business Case for HS2 is based on delivering a high capacity, high frequency and very reliable train service. Level access enables shortest possible dwell times in the most reliable way. It also offers the best accessibility.

e. Their presentation further noted that regarding Inclusivity and accessibility. The HS2 Inclusive Design Policy requires:

    - "...a service that can be used safely, independently, easily and with dignity by everyone.
    - "[that] inclusive design is not an add-on to a design. It will be an integral part of the design and development process
    - "Step-free design everywhere as far as possible"

    Level access delivers inclusivity and accessibility

HS2 asserted that providing Level Access "from street to seat" is a key requirement for HS2 that would provide:

- ***Accessibility*** – Independent, stress-free travel for an ageing population;
- ***Experience*** – Easy to use by all;
- ***Capacity*** – Level access PTI is critical to reliable achievement of 2 minute dwell times, regardless of number of wheelchair users, people with luggage, families etc.;
- ***Safety*** – Mitigating the risk of falls and the burden on staff providing assistance;

Level access "from street to seat" is required at all doorways and throughout train so that

- People of reduced mobility, with luggage, children etc. will board at all doorways. and
- Internal steps to be avoided as far as practicable.

HS2 highlighted in a diagram their understanding of the Level Access concept (Figure 12). ERA concurs that this is the correct understanding in regard to the horizontal and vertical offsets in relation to the platform level. The proposed platform height above rail level, as noted above, does not however comply with the TSIs currently in force.

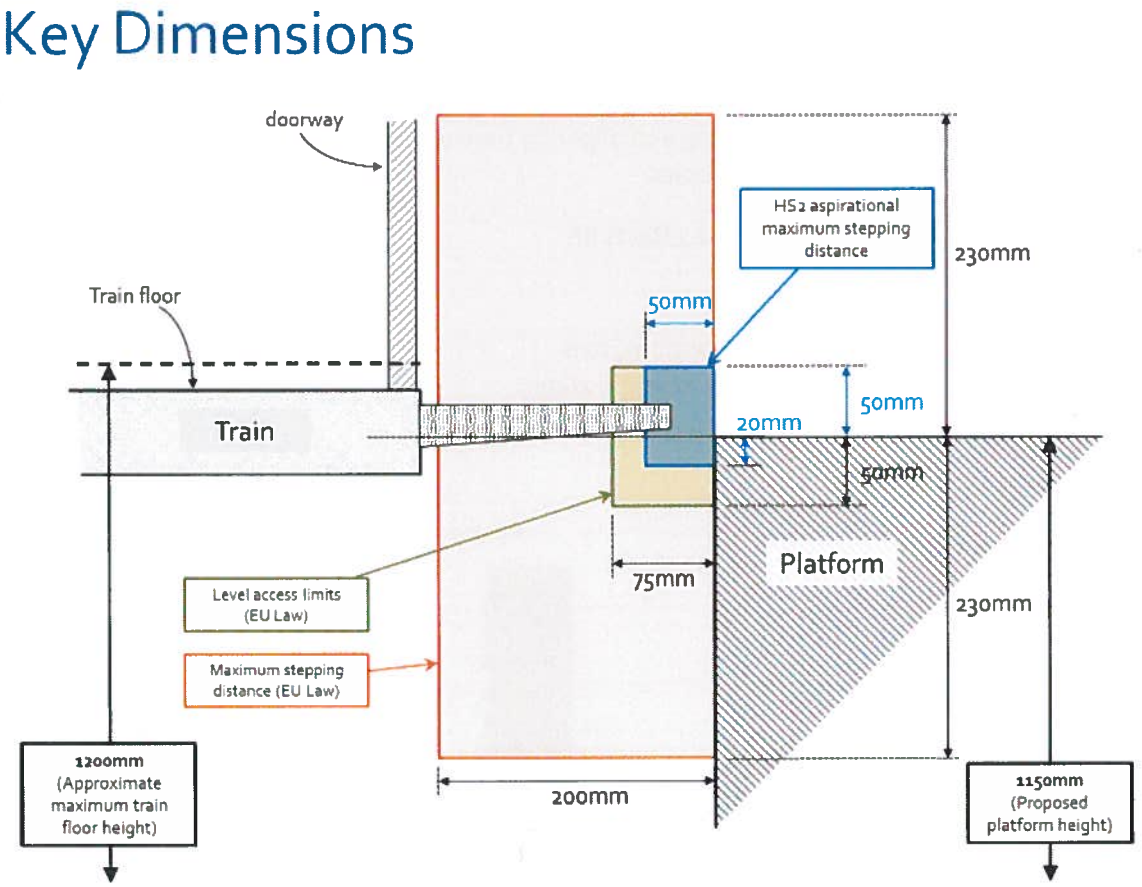

Figure 12. The level access concept (Source HS2)

The HS2 business case argues the issue of accessibility from the point of view of dwell time criticality. The determination of this was based upon average boarding and alighting times both observed and under experimental conditions in a design laboratory.

To back up its assertions HS2 had commissioned research from University College London PAMELA facility (www.ucl.ac.uk/arg/pamela)[9&10]as well as internal reporting on the research[11]. These reports summarized both laboratory testing and real life observation of various boarding scenarios and their implications for station dwell times. Whereas it acknowledges that *"there are many design factors that influence passenger behaviours and therefore, the boarding and alighting time"* and lists *"the exterior door width, the entry step height, platform gap, the layout of the vestibule, how and where luggage is stored, how passengers find their seat, (...) the quality of information provided to passengers on the platform and on board"*, the research studies only the effect of steps on the boarding and alighting time and, for the other aspects, tries to gather more understanding about the topics.

The scenarios tested assessed the effects of:

- Demographic profile;
- Use of luggage;
- Boarding and alighting distributions, and
- Level access, 1-step or 2-step configurations.

The results are summarised in Figure 13 below.

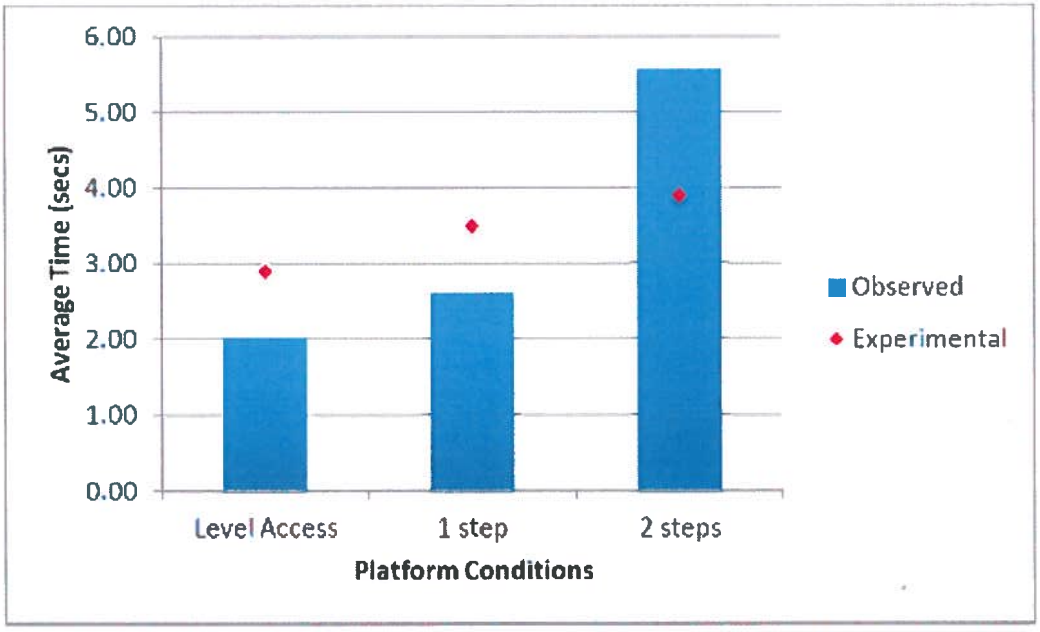

Figure 13. Mean boarding and alighting times from the UCL and other research

This brings a prediction on average dwell time (based on the Train Allocation Model) for the maximum boarding/alighting scenario (East Midland Interchange) for a conventional 25m vehicle train of:

- For level access: 100 sec (lab based results) and 79 sec (real life observations)
- For one step: 112 sec (lab based results) and 94 sec (real life observations)

[9] Holloway, C., Roan, T-R., and Tyler, N. Effect of vertical step height on boarding and alighting time of passengers. V1 UCL December 2013

[10] D Watts, K Jackson ,T Clarke, T Williamson and C Holloway, Passenger Boarding Time Mobility and Dwell Time for High Speed 2, conference paper·September 2015

[11] HS2. Passenger Boarding & Dwell Time Research Report. C240-PBR-HF-REP-000-000004 Revision – PO1 dated 13/03/2014.

This has to be compared with the HS2 dwell time requirement of 120 sec.
The study concluded that *"...under most operating conditions, the HS2 dwell time targets are likely to be met irrespective of the platform-train interface. However, the recommendation is that level access is of significant benefit for ensuring that the dwell time target is reliably met and to improve the usability and accessibility of the train service."*

3.3.2 UNIFE Position

ERA has tried to examine the possibilities that manufacturers could offer in order to minimize the consequences highlighted above that are: increased dwell time and worsened accessibility.

For that purpose a meeting was organized with the Association of European Railway Industries (UNIFE) on 17 February 2016. Prior to the meeting, several questions were addressed to UNIFE about the possibilities to provide level access from platforms at 760 mm or 915 mm arl and the associated technical issues and consequences.

For reasons of competitiveness between its members, UNIFE could only give very general comments, both during and after the meeting through a written answer to the questions raised.

Regarding accessibility, according to UNIFE, level access can be provided from platforms at 760 mm or 915 mm arl through the interface between the platform and the vestibule in the vehicle. UNIFE underlines that there are already high-speed trains providing level access in different countries of Europe at 550 mm or 760 mm arl, either in specific cars or at all doors. ERA noted that HS2 also highlighted the existence of such trains but added that their other characteristics made them unsuitable for the intended service (non-distributed motorisation, low floor level resulting in a narrow usable width on the classic network).

Unfortunately, in its answers UNIFE were not able to give any detailed information on the technical impacts of providing level access from a platform at 760 mm or 915 mm arl Considering that the huge majority of high-speed trains have a continuous high floor at 1200/1250 mm arl even in Europe where platforms are at 550/760 mm arl, there are certainly strong technical arguments concerning the presence of bogies and of technical equipment at the underframe, etc.

However, UNIFE indicates that a change of height in the vehicle would be necessary in any case, in order to pass over the bogies. Assuming a floor level at the bogie of 1250 mm, one can calculate the vertical distance to the platform level and how to overcome this change of height with ramps or steps:

i. From a platform level of 760 mm the vertical distance is 490mm;
ii. From a platform level of 915 mm the vertical distance is 335mm.

According to the TSI PRM, the following steps and ramps are permitted:

i. Steps with a maximum height of 200mm (or 230mm for access steps if it permits a reduction in the number of steps)
ii. Ramps of variable gradients according to their length and location in the train.

It is noted that, from a platform at 915 mm, one access step would cover two thirds of the vertical distance. As shown on Figure 13, the impact on dwell time of a single access step is not that significant. The remaining 135mm can certainly be covered with a ramp. A dedicated wheelchair access could be considered to a car with a lower floor.

Interestingly, the company Alstom Transport (AT) unveiled a high-speed concept train design at a parliamentary reception in London on May 24[12]. Presented as "'one possible option' for rolling stock which would operate services on the future High Speed 2 network", the concept derives from the TGV Duplex family and, for the Captive fleet, "features short wheelbase power cars and 20 m long intermediate double deck trailer cars" while single deck trailer cars would be proposed for the Classic-compatible fleet.

While this proposal is only conceptual at the present time, Alstom indicates its ability to "offer an alternative, such as a successor to its AGV trainset with distributed traction which is used in Italy" depending on the tender specification issued by HS2. It shows, however, that manufacturers consider that alternatives may exist to what HS2 has asserted to ERA:

i. HS2 claims that distributed traction is mandatory. The article says that the proposal consists of power cars and trailer coaches, and
ii. HS2 claims that high platforms are required. Here the article says nothing about the access to the coaches, but the known architecture of the Duplex family is such that the access from high platforms would be extremely difficult from a technical perspective.

Following the publication of the article ERA sought a meeting with Alstom Transport. This is discussed separately below.

To conclude, the Agency had the impression that train manufacturers are reluctant to publicly disclose technical discussions they may have with a possible future customer and to provide details of alternatives they may offer. This is understandable in a competitive context. On the other hand, we had the impression that HS2 by strictly sticking to some requirements for the rolling stock (distributed traction, level access, and high floor) and, by focusing on these key aspects, were preventing viable alternatives being proposed now or in the future.

[12] http://www.railwaygazette.com/news/single-view/view/acela-influences-alstoms-hs2-concept-train.html?sword_list%5B%5D=HS2&no_cache=1

3.4 What are the implications for the Single European Railway Area if a high platform is allowed?

3.4.1 HS2 position

HS2 claim that the new HS2 line is planned to be segregated, with no direct connection with HS1. Hence, the implications for the Single European Railway Area of a 1200 mm platform height would be minimal. However, if connections with the rest of the rail network were to be provided (e.g. connection with HS1), HS2 acknowledge that rolling stocks other than the 'Captive' and 'Classic Compatible' would need an 'innovative step solution' to be able to stop at stations with 1200 mm arl platform height.

The provision for steps to be made to both 'Captive' and 'Classic Compatible' HS2 fleet aimed to be transferred to another high speed route with existing TSI compliant platform heights, could be achieved at relatively modest cost, if designed in at the manufacturing stage.

Existing 'European' rolling stocks fleet (single deck high-speed trains) have a natural floor height of ~1200 mm, therefore supplier deliverability should not be compromised by choosing high platforms at HS2 station. However, the ability for a train to visit all 3 platform heights (550 mm, 760 mm and 1200 mm) is considered challenging and would require significant efforts from the manufacturers.

3.4.2 UNIFE position

Although it is technically possible to cope with the introduction of a third target platform height in the INF TSI, it is UNIFE belief that this challenge would put interoperability in jeopardy and would reduce the possible harmonization at the vehicle level.

According to UNIFE, a platform height of ~1200 mm would result in a restriction to both domestic and international train operation and to competition among operators: passengers travelling from/to continental Europe to/from the UK on and off the HS2 route(s). They would likely need to change train in London to continue their journey. If, on one side, it is conceivable for the newly designed and manufactured HS2 trains to be able to visit, in addition the ~1200 mm, the two TSI target platform heights, this would not be the case for the rest of RUs whose existing train fleet would be impeded from operating on the HS2 line.

According to UNIFE, a platform height of ~1200 mm would result in a restriction to competition among manufacturers: under the hypothesis that if a train manufacturer were chosen to develop this HS2 specific solution, this manufacturer would have in the future an important competitive advantage, thus creating a situation of virtual market dominance for delivering trains to HS2.

The introduction in the TSI of a third platform height and, therefore, the ability for a train to be able to visit all three platform heights (550 mm, 760 mm and ~1200 mm) is seen by UNIFE as the main technical difficulty: it would require very sophisticated mechanism within the trainset (especially, at door and step level) in order to guarantee, for instance, pressure variation and air tightness. Even if some ideas have been presented, their technical feasibility is at present still uncertain. Moreover, it would not be cost-wise reasonable to ask all operators in Europe to deploy such complex door/step systems in the fleets.

3.4.3 CER position

ERA held useful discussions with CER on the case. It was left to CER and their membership to decide whether or not to publish an official Position Paper on this matter. On the 3rd October 2016 a Position Paper was published by CER on their website[13]. The majority of CER members agreed that:

- A derogation or specific case would be new obstacles to interoperability, and
- A new target system would slow down opening access to the network.

There were a minority of CER's members (two) in favour of proposing the 1200 mm-high platform as an "innovative solution". The position paper states that:

"According to the Agency's first technical opinion, the HS2 project was not allowed as a specific case; however if the 1200 mm-high platform is accepted as an "innovative solution", it would then be integrated in the core text of the TSIs and form part of the target system. In case a new target system is introduced in the TSIs, this would inevitably lead to some impact on the existing target systems and the modification of the related TSIs. CER members, on this point, believe that a new target system could slow down the open access to a Single European Railway Area.*

** except HS2 and ATOC which are in favour of proposing the 1200 mm-high platform as an "innovative solution"."*

The position paper went on to note that:

"From the railway infrastructure managers' perspective a third target system would lead to higher costs and less efficiency in the railway system as a whole. This especially concerns the interface between the platforms, rolling stock, equipment for passenger accessibility, etc. Therefore the view is that this is in contradiction with what the sector wants to achieve with interoperability.

Railway companies' strategies currently do not consider, for future plans, platform heights with a deviation from the current target system."

In respect to rolling stock and operations:

"...the cost of rolling stock and operations would increase if a new target system were in place. Existing rolling stock would not be able to operate on the new target system as the new height requires more than just minor modifications."

From an accessibility and PRM perspective they state:

"Vehicles which offer level access at a platform height of 1100-1200 mm, at all external doors, could only operate at the other platform heights by using two or three external steps, building stairs or requiring equivalent equipment like a lift. This could have an impact on safety; additional injury risks would need to be analysed and evaluated, as well as additional costs.

Moreover persons with reduced mobility would have better access to/from the train at the HS2 stations but worse access at all other TSI-compliant stations, which would be equipped with alternative access facilities. The same difficulties could potentially be encountered for the access between the higher platform and the classic fleet. The appropriate way to consider PRM needs is to adopt interoperable solutions, applicable to the Single EU Railway Area without new compatibility problems."

[13] See http://www.cer.be/publications/latest-publications/hs2-proposal-platform-heights-cer-position-paper

3.4.4 EIM position

ERA exchanged e-mails with EIM on the case. On the 27th January 2017 EIM published their official Position Paper on this matter[14]. EIM had given detailed consideration and felt that there were three possible options that might address the issue, namely:

1. Derogation by TSI Change;
2. Derogation by Specific case, and
3. Derogation by Innovative Solution.

EIM examined each of these situations and concluded, in respect to TSI change, that:

> *The current TSI INF platform height target systems of 550mm and 760mm have been endorsed since the early 1990s. This has resulted in EIM members making significant investment to allow their new and existing infrastructure to comply with these heights.*
>
> *If an additional target system or 'Class A' height was to be introduced to the TSI INF, it is expected that the Agency would need time to determine what the right value for a standard level access platform height would be.*
>
> *Due to these factors and the lack of information and experience of what an additional target system height of c.1200mm would entail, EIM members do not endorse an additional target system to the TSI INF at present.*

In regard to a derogation by Specific Case they stated:

> *While it is believed that there is nothing preventing a Member State having several specific cases, it has been argued previously that granting additional specific cases contradicts the principles of a trans-European transport network and its Regulation.*
>
> *The Agency has stated that, due to the characteristics of the HS2 project (for example, that it is a new railway), it cannot be classified as a specific case.*

Equally, they did not consider a derogation by Innovative Solutions to be workable:

> *EIM does not consider an 'Innovative solution' to be an appropriate mechanism since, if it is successful, the new platform height should become an additional target system in future TSIs. This follows from the wording in the Article 10 (4) of the INF TSI:*
>
> > "The Commission shall deliver an opinion on the proposed innovative solution. If this opinion is positive, the appropriate functional and interface specifications and the assessment method, which need to be included in the TSI in order to allow the use of this innovative solution, **shall be developed and subsequently integrated in the TSI during the revision process** pursuant to Article 6 of Directive 2008/57/EC. If the opinion is negative, the innovative solution proposed cannot be used."

They concluded that: EIM members have no desire for an additional (third) target system to be included to the TSI INF. EIM, with the exception of its member SNCF Réseau, felt that an additional specific case to the United Kingdom enabling the use of c.1200mm platform heights as a pragmatic solution for addressing the concerns of PRM providing that it did not block interoperability in the European network would be acceptable.

3.4.5 EPPTOLA position

ERA exchanged e-mails with EPPTOLA on the case. EPPTOLA is opposed in principle to the construction of new railway infrastructure in the EU that are not in compliance with the Technical Specification of Interoperability and with agreed National Technical Rules. The introduction of a "new" target platform height in the INF TSI would increase diversity in the EU railway network and could potentially concede to any possible request for a new target platform height in the future.

3.4.6 EDF / AGE Platform position

In order to get the opinion of users, the Agency organized a meeting with the following associations:

- AGE Platform Europe (AGE): a European network of more than 150 organisations of and for people aged 50+ representing directly over 40 million older people in Europe.
- European Disability Forum (EDF): an independent NGO that represents the interests of 80 million Europeans with disabilities. EDF is a unique platform which brings together representative organisation of persons with disabilities from across Europe.

These associations were chosen by the Agency as interlocutors because they are representative at European level and they participated to the Working Party in charge of the preparation of the Regulation 1300/2014 (PRM TSI) and are familiar with topics and concepts such as interoperability, specific cases, etc. They are also aware of the technical constraints of the railway system.

The Agency organised a meeting with EDF and AGE to get their opinion about the proposal from HS2. Prior to the meeting, general information about the project and the technical opinion ERA/OPI-2015-4 were forwarded to the participants.

The first remark is that HS2 offers what associations are endlessly calling for, i.e. a railway system that offers spontaneous and independent access to all passengers. Then, it is noted that level access will be possible only in the HS2 new stations; four stations are concerned for the Phase 1 (London Euston, Old Oak Common, Birmingham Interchange and Birmingham Curzon Street) and five additional stations for the Phase 2 (East Midland Hub, Sheffield and Leeds for the eastern line and Manchester Airport and Manchester Piccadilly for the western line). Associations are concerned that steps will still exist for all other stations and wonder if there is a long-term strategy in the UK targeting level access between all platforms and trains, with a standard platform height?

A key aspect for PRMs is also the possibility of making through journeys; anything that causes people to change trains is a disadvantage. The case of a closed or segregated system making necessary a change of train is acceptable provided that the station interchange is accessible. With this in mind, associations were very disappointed with the currently planned transition between HS2 and HS1 (i.e. get down from a train at Euston and take another train at St Pancras, rather than having a through train).

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[14] See http://www.eimrail.org/publications/position-papers/hs2-proposal-for-level-access-at-the-platform-train-interface

From a wider perspective, considering the consequences at European level, associations confirm their opposition to a third platform height in the target system. Their opinion is that solutions for a better accessibility should come from the rolling stock and not from the platforms. Rolling stock manufacturers must develop on-board devices enabling spontaneous and (if possible) independent access to the trains.

3.4.7 **Transport Focus position**

Telephone calls and a tele-conference was held with Transport Focus on 7 April 2016.

Transport Focus has a long history (in the UK) of representing passenger needs going back for nearly 70 years. They started out as the Transport Users Consultative Committees in 1947 then became the Rail Users Consultative Committees, then the Rail Passengers Committees and more recently Transport Focus. They now represent users and potential users of:

- Rail (in Great Britain but outside London)
- Bus (in England outside London)
- Road (the Strategic Rail Network – SRN – in England).

They have a general duty to represent the interests of the transport users.

They have been investigating the implications of HS2 for passengers who might use HS2 in future and have set up a research panel to assess what people want from HS2. The research panel is an online panel funded by HS2 but managed by Transport Focus. Transport Focus have recruited a community where panellists are asked to provide regular insight/feedback on key issues around the development of HS2. The panel consists of 40 rail passengers giving their views and ideas via workshops through this online community. There is an equal gender split and a wide geographical spread. Passengers with disabilities, commuters, leisure and business travellers are also included. After the first year, they published a summary of the findings and they are hoping to publish the second year's findings in spring 2016.

The findings from the published work suggested that some potential passengers viewed step free access as a hugely positive development, this being especially important when the development of an aging population was taken into account. However, it was noted that the issues concerning "step free" access did not feature largely in the mainstream surveys of passenger opinion. Typically, 90% of passengers will not have a problem, whereas the representatives of disability, accessibility and mobility groups felt that this was important. For such groups the ability to travel independently, without booking ahead was seen as very important.

TF provided the Agency with quantitative and qualitative evidence they had collected from such surveys or studies concerning this view. TF indicated they conduct a large scale satisfaction survey twice a year (about 27000 passengers per survey). While not totally applicable, it gave a sense of the issues related to the UK HS2 technical opinion. They had extracted from the findings of such surveys the separate results of passengers with disabilities and those without concerning accessibility of such passengers to the railway.

- Transport Focus has the following key concerns regarding the HS2 project that had been raised by the HS2 research panel. In summary these were:
- Step free / level access – if you spend £30 billion on a new railway and you have to step onto it in any way then something must have gone wrong;

- Dwell times – HS2 had convinced them of the criticality in providing the high frequency of train services;
- Door widths – HS2 indicated these would be addressed at the detailed design stage;
- Luggage space – this too has to be addressed in the detail design of any new rolling stock;
- Issues concerning periods of disruption or delays – the panel had indicated the need to have train or platform staff available, and
- The issue of passenger assistance.

TF indicated that Mystery Shopper studies had been undertaken of the various journey components. In a Mystery Shopper study someone from Transport Focus or research companies commissioned by Transport Focus act as a potential or real customer to determine the actuality of a journey. All of the people doing the testing were persons with actual disabilities. In these studies the passenger assist function (where a passenger requires assistance from train or station staff to board or alight from a train) had been shown as a weak link, especially during times of service disruption on the UK network. When this happens, passengers in the PRM category, and especially those in wheelchairs, need to have the pre-booked assistance otherwise this causes problems. During disruption train staff will be trying to ensure, for their train, that the disruption is minimised. Station staff may find themselves conflicted in providing assistance. Examples were noted of passengers awaiting to alight have the tendency to use the Emergency button, while those trying to board will have to await the deployment of boarding ramps before the train is allowed to leave the station. Both situations can cause serious operational consequences. With the ability to access a station and board or alight from a train independently and spontaneously these problems are removed. Clearly this has a value. Again, we asked for further information, if this was available. TF sent us the link to the latest research, carried out in 2013 and published in March 2014. This study reported on cases where help was not provided.

The discussions with TF also addressed issues of interoperability:

- The abandonment of the link from HS2 to HS1. The Transport Focus view was that probably 99% of the journeys on HS2 would be domestic in nature. It wasn't such a far distance to walk between Euston and St. Pancras (HS1 station).
- Level access at 915 mm arl. The UK has the specific case in the TSI for 915 mm arl. TF stated that if level access to the platform could be achieved at 915 mm arl, Transport Focus would not have a problem.
- Train services in the UK with level access, e.g. the Heathrow Express and Heathrow Connect services. Transport Focus' remit did not extend to these services as these came under the London TravelWatch – the independent, statutory watchdog for transport users in and around London. This organisation is funded by the London Assembly (the regional governing body for the 33 London Boroughs), and speaks for all London transport users on all modes of transport.

3.4.8 London TravelWatch position

A meeting was held with London TravelWatch on 25th April 2016. London Travelwatch (LTW) are a statutory Board of Members with a remit to represent the travelling public in the London area. They can make recommendations with respect to – any matter affecting the functions of the Greater London Authority or Transport for London which relate to transport (other than of freight). Other legislation places a similar duty upon them to keep under review matters affecting the interests of the public in relation to railway passenger and station services provided wholly or partly within the London railway area, and to make representations about them to such persons as it thinks appropriate.

LTW had made representations and had petitioned against HS2 on its merits. Whilst not against the principle of the high-speed rail route they were concerned that the proposals affected those whose interests they served, including Persons with Reduced Mobility.

At the meeting they clearly showed these concerns and how they were working with railway operators in the London region to improve the travel experiences of such passengers. LTW had raised the issue of stepping heights and distances with the railway sector in London because passengers using London's transport systems think these issues are problems. They were trying to encourage sector players to improve the safety relating to these problems.

Three stations were highlighted where they had implemented level boarding at stations on the "classic" rail network in South London – Tulse Hill, Elephant & Castle and East Croydon. At these stations the platform is raised along the whole length so that "level" access is achieved to the train. This raised area can be removed for "special" trains to pass ["special" in this case means trains other than those that normally work the route]. The results of such initiatives show they are very effective in reducing accidents, particularly "trips, slips and falls". They are also effective in reducing dwell times and this has a positive effect by reducing the lateness of trains and thereby increases punctuality. On one island platform, with level access, at East Croydon station there was a more than 30 percent improvement in dwell time from 90 seconds per train down to 60 seconds per train. LTW have said that "level access is desirable" and have seen this happen on London Underground's Circle Line, Thameslink NRN route and Elizabeth (formerly Crossrail) Line projects (part NRN, part Transport for London). While LTW prefer level access to the train, the priority for HS2, as stated by LTW, would be for level access throughout the train and everything else being sacrificed to achieve this.

Regarding HS2, between the proposed HS2 network and the existing NRN there would be a large step and gap in order for passengers to board the trains. This will create problems for the trains leaving the HS2 network at Birmingham for cities like Manchester or Liverpool. HS2 indicated to LTW that they "...cannot do level access at 915 mm as this would cost more".

However, LTW have pointed out to HS2 that in phase 1 of the proposed scheme 7 out of 10/11 trains per hour in each direction will access off-HS2 cities and towns and in phase 2 of the proposed scheme 8 out of 18 trains per hour per direction will do so.

LTW seek "Access for all". The small doorways on Eurostar and Intercity trains plus their internal designs impact upon dwell times at stations. The design of carriages with their end doors, steps and luggage racks created these problems whereas coaches with perhaps 1/3rd and 2/3rd positioning of doors might enable reduced dwell times because more effective internal distribution facilitating faster boarding and alighting. They cited the case of Bath Spa station where the high-speed trains suffered dwell time problems due to the end doors. Dwell time problems might be overcome by having two platforms for each direction at HS2 intermediate stations to address such issues.

LTW agreed with the April 2015 Technical Opinion. Equally, they were largely in accord with the findings of the recent RSSB Platform and Train Interface Strategy. They are part of RSSB's steering groups and contribute to the reports. While the research they were involved with reflected the large "suburban" body of rail users in London, the problems also affected every Intercity train arriving or leaving London.

In the dialogue between LTW and HS2 a number of issues had been raised that LTW indicated had not been resolved to LTW's satisfaction. They included:

- the design and cost of the rolling stock – particularly equipment location on the trains;
- platform heights, and
- the 400 km/h maximum speed.

It very much appeared to be HS2 designing a train to serve platform heights at about 1200 mm arl. This ruled out the possibility of having double-decked trains. LTW had indicated their strong priority was for 915 mm arl as this benefitted all UK passengers. They did not want the passengers they represented to be faced with a dual standard. However, they indicated, these issues has hardly been touched upon in the Hybrid Bill process. LTW had however raised accessibility issues relating to the Euston station terminus and Old Oak Common station and particularly level access between the platform and the train for the two types of rolling stock proposed Captive HS2 and Classic compatible.

Franchising and re-franchising were also issues. LTW felt HS2 could stop TSI compatible trains wishing to access the route. HS2 appeared to be blocking out a chunk of the market and had indicated "You can never have competition on this route". LTW expressed the view that HS2's argument for having something special was because they think that they can pressure others, e.g. Railway undertakings (RUs) into wanting the same. But cutting off the future would be bad, e.g. places without direct HS2 services - North Wales/Holyhead and parts of Scotland. These were clear findings which came out voluntarily, not prompted, from the focus groups organised by HS2/TF that the Platform Train Interface was a barrier to travel. Non-users cited the platform gap putting them off travelling by rail. LTW noted this was a long-standing issue that had come out from the Surface access studies to UK Airports back in the 1990's. LTW had campaigned on this issue.

LTW also highlighted the issue of links between HS2 and HS1. While the proposed physical rail link was now out of the Hybrid Bill, the alternative Brill Place pedestrian route was an active point of contention with LTW. For PRMs frequency of trains isn't an issue but blocking through journeys out at an early stage would be a disbenefit to PRMs [There are existing links near St Pancras].

In respect of a HS2/LTW dialogue this was not ongoing at the time of the meeting. There are formal contacts in connection with the hybrid Bill process and there are links at the Director LTW/Managing Director HS2 regarding the rail link. However, at a general level LTW hasn't "presented its views to HS2 in a while". The 915 mm arl platform height had been logged and was on the table. HS2 asserted that it (level access) "wasn't possible", to which, LTW had retorted "Prove it!". On the door location issues the specification for the Norwich – London rolling stock (Norwich in 90 project) were for 1/3rd and 2/3rd spaced doors on EMUs.

LTW were aware that the TSI PRM does not say unassisted access – and they are fully supportive of the above. Another issue the UK loading gauge would be the HS2 – HS1 compatibility. However, LTW did not know whether this would become a real issue.

Clearly HS2 are trying to pressure all that might influence this. The hybrid Bill for the project was currently in the House of Commons and would move to the House of Lords in Q3/Q4 2016. LTW stated that the UK Government was firmly behind the project but probably genuinely don't fully understand the platform height and level access issue. Other issues include:

- Width of internal gangways;
- Big wheels (to efficiently achieve the maximum speeds), and
- Number of platforms at Old Oak Common and other intermediate stations (particularly, the frequency through platforms).

3.5 Other responses or consultations

The summaries of the following three meetings do not express opinions or positions. These meetings were held to inform or confirm ERA's understanding in developing the opinion.

3.5.1 Meeting with the Rail Safety and Standards Board (RSSB)

A meeting with the Rail Safety and Standards Board (RSSB) was held on 25 April 2016. RSSB confirmed that they were currently updating the UK's gauging standards. These standards covered the platform height and stepping distances that passengers would be subject to in the course of their journeys.

A platform height of 915 mm arl is the target (permanent specific case) for the UK NRN (Network Rail Infrastructure). The existing high speed network (HS1) has TSI conform platform heights at 760 mm arl.

It is RSSB's setting of the rules that maintains network compatibility. Railway Group Standards (RGS) require that changes to platform heights are made where there is "A reasonable opportunity to amend the platform height." This for example might happen where a station or line of route were to be upgraded or changed in a significant way. However, there exist a large number of places where platform heights are lower or higher than the current standard. High platforms, i.e. above the target system level of 915 mm include:

- Heathrow Express
- North London Line (part) – this is operated by the London Overground concession – this is awarded by Rail for London which is part of TfL. It should be noted that all stock stops at all stations and there are no freight trains through the passenger platforms as they travel on parallel tracks.

It should also be noted that the central section of Crossrail (now the Elizabeth Line (EL)) will also have high platforms at its stations in Central London – Paddington EL, Bond Street EL, Tottenham Court Road EL, Farringdon EL and Liverpool Street EL. A derogation for this from the TSI was given in 2010 following an Agency Technical Opinion[15]. High platforms had been included to achieve level access because this was a London public transport requirement. While this gives rise to level access to and throughout the trains at stations between Paddington and Whitechapel/Woolwich (the central section of the route) and on the Heathrow branch height differences between platforms and trains will give rise to increased passenger boarding risks at stations to the east of Whitechapel and Woolwich and to a lesser extent at stations to the west of Paddington after opening and into the medium term.

For both the TSI and the UK conventional mainline network specific case unassisted boarding for wheelchairs (="level access") is not at the moment a target – even though it is achieved in several places in the EU (e.g. at a number of stations in France including Valenciennes, the seat of the Agency) with some rolling stock. It would seem reasonable to contemplate this in future versions of the UK RGS that forms the specific case and in the future revisions of the TSI.

It was noted that stepping distance and platform heights are close to the TSI heights in PRM but do not match exactly – hence the need for the specific case.

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[15] Agency Technical Opinion 2010-6. A derogation was granted to the Crossrail (now Elizabeth Line) Project under article 9.1 d of the Interoperability Directive which states that derogations may be given *"for any proposed renewal, extension or upgrading of an existing subsystem, when the application of these TSIs would compromise the economic viability of the project and/or the compatibility of the rail system in that Member State;"*.

The issue of level access inside the train throughout the length of the train was discussed. ERA asked whether any direction had been given to RSSB concerning level access within a train and if so its relative priority to level access through the train? RSSB indicated they had not been given this remit. Even "Access for All" does not require access through the train. "Access for All" is the Access for All Programme started in 2006, and is part of the Railways for All strategy, to address the issues faced by disabled passengers using railway stations in Great Britain.

The current requirement is: Access to designated areas in a train. This can be summarised as follows: Good access to a train in an easy way. Access to the train at the majority of stations in the UK is assisted via boarding ramps. The 75 mm / 50 mm Research Project was also mentioned (See below).

In the current framework of the RGS and TSI a wheelchair does not normally have access to all parts within a train. There will be designated locations for wheelchairs in normal trains with access to facilities. For example, from such designated areas, in the train, wheelchairs will be able to access toilets suitable for PRMs.

New Class 700's for Thameslink will provide level access but not at every station. The level access will be provided by a platform hump that lines up with a designated vehicle. The reason for not providing these at all stations is due to the need for electrical clearances. This designated vehicle approach is also useful/necessary both so that any staff assisting alighting at assisted stations and staff involved in emergency evacuation know where to find the wheelchair users.

The problems with Heathrow Express were discussed (where it has been necessary to fit platform extensions to mitigate the "tripping hazard caused by level access"). This issue is illustrated in the photographs above.

It transpires that with the plug doors on HEX and some other UK stock (e.g. class 165/6) there are two height changes. Platform to step-board and step-board to vehicle floor. Although within the definition of "level boarding (+75 mm horizontal +50 mm vertical) this double step is more difficult to judge than a single step platform to floor and constitutes a trip hazard.

3.5.2 Meeting with the Office of Rail and Road

A meeting with the Office of Rail and Road was held on 22nd July 2016 to gain a detailed understanding of the UK legislation and the transposition of the Interoperability Directive into UK law. ERA understand that the proposed HS2 Route is part of the Core railway network as set out in Regulation 1315/2013[16].

We posed two questions for discussion about how authorisation would be approached for a project non-compliant with a TSI and secondly whether there was an obligation in the UK legislation for ORR to actively oppose non-compliant proposals.

[16] REGULATION (EU) No 1315/2014 of the European parliament and of the Council of 11 November 2013 on Union guidelines for the development of the trans-European transport network.

ORR told us that the relevant UK legislation is set out Railways (Interoperability) Regulations 2011. These regulations transpose the Interoperability Directive into UK national legislation[17]. These regulations have been amended by three subsequent sets of regulations: The Railways (Interoperability) (Amendment) Regulations 2013, the Railways (Interoperability) (Amendment) Regulations 2014, and The Railways (Interoperability) (Amendment) Regulations 2015.

It would appear that if the platforms did not conform to the relevant TSI then ORR could not issue an Authorisation (regulation 7(2)(c)). Without such authorisation it would be unlawful for HS2 to bring those platforms into use for passengers (regulation 4(1)(a)).

However, Regulation 14 of the 2011 regulations provides for derogations to be issued by the Competent Authority. In Great Britain this function is reserved to the Secretary of State, i.e. the UK Department for Transport. Regulation 14 only permits derogations to be issued in a limited range of circumstances and in some of those cases with the agreement of the Commission.

From the point of view of the legislation, HS2 does not appear to be able to fall within any of the cases listed under regulation 14. It was therefore not possible to see how this regulation could be used by the Department for Transport to issue a derogation. Hence the original reference for a technical opinion and this subsequent revised reference.

Regulation 16 requires that the Project Entity must not draw up a verification declaration unless it is satisfied that the essential requirements are met, including the Technical Specifications for Interoperability. So, again, it would be hard to see how HS2 could draw up a verification declaration if part of their infrastructure was non-compliant with a TSI.

The UK legislation does not appear to contain any responsibility for the NSA to actively intervene if it became or becomes aware of any proposals that do not conform to TSI or National Notified Technical Rules (NNTR) requirements. The sanction available to the ORR, when it becomes aware of a project not conforming with the TSIs or NNTRs would be to not authorise them.

If non-complaint infrastructure or vehicles were brought into use without an authorisation then ORR would then have to consider what enforcement action to take in response. ORR has an established position on how it can use the existing criminal law enforcement powers to issues such as breaches of the Interoperability system. These powers are set out in part 3 and annex A of "Supplementary guidance to HSE's Enforcement Management Model for ORR"[18].

Where Annex A of the ORR's Enforcement supplement indicates that a substantial difference from the technical standard would have an 'Initial Enforcement Expectation' of an Improvement Notice and that there is the potential for Prosecution then ORR would be empowered to act. This is an initial position, however, and this Model does then require the application of 'duty holder' and 'strategic' factors of the Model to this initial expectation to come into play, i.e. ORR and an applicant would begin serious discussions to correct this position.

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[17] See http://www.legislation.gov.uk/uksi/2011/3066/made with amendments at http://www.legislation.gov.uk/uksi/2013/3023/made, http://www.legislation.gov.uk/uksi/2014/3217/made and http://www.legislation.gov.uk/uksi/2015/2022/made

[18] See http://orr.gov.uk/__data/assets/pdf_file/0017/6443/supplementary-guidance-to-hse.pdf

With the HS2 project not having yet received its Parliamentary Powers it was difficult for ORR to become involved with the project. A recent report of the UK's Public Accounts Committee stated that the earliest target date for achieving these powers was December 2016 and that HS2 are now on course to achieve this[19]. While the civil engineering was not seen, by ORR, to be a problem the rolling stock engineering was. The critical issues perceived by ORR in respect of HS2's proposed rolling stock were:

- Level boarding;
- The acceleration and deceleration characteristics of the proposed rolling stock;
- Dwell times at stations;
- Whether the rolling stock was a "locomotive" powered train or had distributed power for traction purposes;
- Vehicle weight and corresponding axle weights, and
- Whether articulation was used.

[19] See http://www.publications.parliament.uk/pa/cm201617/cmselect/cmpubacc/486/48606.htm#_idTextAnchor008 At paragraph 4.

3.5.3 Meeting with Alstom Transport to discuss the HS2 Concept Train

A meeting was held with Alstom Transport (AT) on 31st August 2016 to discuss their HS2 Concept Train noted above. Alstom explained that they had a Non-disclosure Agreement with HS2 but were happy to discuss issues that had been put into the public domain regarding this concept train or Alstom's general return of experience in relation to the issues at question in this technical opinion.

The points of view expressed are particularly relevant given ATs long experience in building and maintaining HS trains worldwide. The Agency noted the fact that AT chose to reveal, publicly, a proposal not compliant with the requirements that HS2 keeps presenting as intangible (such as distributed traction and level access from high platforms).

AT, stated that technically there were a broad range of steps that could be taken to address the problem of level access. For a commuter train it was not a problem as you could move the floor height to accommodate level access. However, for mainline high-speed trains to accommodate the possibility of different platform heights across the full range of platform heights was very difficult. In France, on the HS lines, there were not frequent stops and therefore dwell time was not particularly important – what was important was the boarding time which was affected by the amount of luggage carried and by the time then taken to find a seat.

AT indicated they (HS2) should take platform height and use it as part of the input to the system specification. AT were aware that HS2 needed capacity but by indicating a platform height of 1200 mm arl they were effectively limiting the trains to being single deck trains – AT believed they and other manufacturers would not be able to offer double decked trains (to deal with the capacity issues) with high platforms.

As part of their studies AT had analysed the various options relating to rolling stock types and platform heights. This is summarised in the *Table 1* below.

	TSI Compliant		UK TSI Specific case	Non TSI
Platform height above rail level (Millimetres)	550	760	915	1200/1250
Rolling Stock type(s)				
High floor trains adapted for high platform (China, Japan...)	Not compatible	Not compatible	One/two steps up	Level access
High floor trains (TGV, Velaro, AGV, Zefiro...)	Three/four steps up	Two/three steps up	One step down to the external device, then two/three steps up	Not compatible
Low floor trains (Talgo/Stadler)	One step up	Level Access	One step down with current trains. Level access may be achieved by different internal floor height	Not compatible
Double deck in narrower gauge (like Eurodouplex for FR network)	Eurodouplex has two internal steps down.	Eurodouplex has one external step and two internal steps down.	Not compatible	Not compatible
Double deck in GC gauge (like double deckers in Switzerland)	Level access is possible	Level access is possible	Probably/possibly not compatible Maybe one step down?	Not compatible

Table 1.AT analysis of rolling stock type and platform height

In terms of the dwell time issues AT had carried out extensive simulations. Every stepping action required adds 10 seconds to the dwell time, e.g. 1 step adds 10 seconds, 2 steps adds 20 seconds and so on. If the 90 second "doors open" time is to be achieved then having two steps becomes very difficult – particularly on the classic network.

AT highlighted other issues that might become relevant including costs of operation for:

- Operational/Personnel;
- Energy;

- Rolling Stock maintenance, and
- Train ownership.

In addition there were also cost issues relating to track access charges. In terms of maintenance of the track this is a function of fatigue and wear. While it was possible to extrapolate the likely changes when we move from 320 km/h to 350 km/h, the issue is that there is only limited return of experience of operating at 350 km/h, e.g. France from 2007, and China and Germany more recently. They noted that in France on the LGV Est Paris – Strasbourg (406 kilometres) by TGV takes 1h 46 minutes at 320 km/h as against 1h 42 minutes at 350 km/h – a saving of four minutes. With the increases in energy and maintenance and also track configuration to take into account (given the bodyshell structures and the pressures on vehicle structures with closing speeds of between 640 km/h – 700 km/h. In France the distance between track centres is 4,5 metres) the economics of going to such speeds was questionable in business case terms. This evidence presented by AT was based upon 35 years' experience of manufacturing, and maintaining railway vehicles operating on high-speed lines worldwide.

Two CIVITY Management Consultancy studies were mentioned that had published detailed findings on such issues. They noted that in Germany they have reduced the speed of new high-speed rolling stock to 250 km/h for some of the above reasons.

In one of the studies, of Spanish high-speed train services, the cost breakdown showed track access charges and the marginal costs of rolling stock maintenance. This study concluded that if RUs operated at 380 km/h they were subjecting themselves to significant business risks. Taking backward steps, e.g. reducing speeds after starting out high, typically lead to a worsening of the business case. This contrasted the situation in Italy where the Bombardier Zefiro train has entered service at 300 km/h. A step-by-step approach will then see this raised to 350 km/h. On the issue of costs and economics of high-speed rail AT also mentioned the studies undertaken by the French Cour des Comptes on the cost and economic performance of the French high-speed rail system.

Another issue touched upon was the issue of small fleets, e.g. having a small fleet of trains was going to incur some high fixed costs in acquisition costs. While AT were not averse to supplying rolling stock fleets of any size clearly order size dictated the prices that could be offered. They noted the recent order by NTV for 8 trains (Pendolino type). To begin to have economies of scale needed an order of about 40 trains.

Alstom explained their current Avelia rolling stock concept aimed at high-speed markets. Table 2 highlights the main characteristics and features.

Platform	AVELIA			
Type	Euro-Duplex	Liberty & TGV 1N	AGV	Pendolino
Double (DD) or Single Deck (SD)	DD	SD		
Traction	Locomotive		Distributed	
Articulation	Yes			No
Tilt	No			Yes

Table 2.AT Avelia high-speed passenger rolling stock platform characteristics

It is understood that other manufacturers have concept trains or have built production trains that give level access at TSI heights or TSI Specific cases. Examples include those brought to our attention by Lord Berkeley, built by Stadler for SBB and the Aeroliner 3000 concept train by the Deutsches Centrum für Luft und Raumfahrt (DLR, German Aerospace Centre). Undoubtedly, given the size of the potential rolling stock order for HS2 other manufacturers will be keen to advertise their concepts.

3.5.4 Letters from Lord Tony Berkeley, UK House of Lords

In his first letter dated 30th October 2015 he challenged the assertions made by HS2 on the following grounds:

- The need to have a third TSI height for platforms, because he wished to see harmonisation of platform heights in the UK;
- The options given by HS2 to justify this third platform level do make the design of steps on the trains very complex and expensive;
- The 2 minute dwell times at intermediate stations, and
- The need to connect in the future to HS1. The proposed link had been dropped from the proposed current legislation.

He stated that it was "...desirable to have level access between platforms and trains and to make any steps as easy as possible, but there are TSIs for high speed trains for very good reasons; so that trains can be as interoperable as possible between member states, and ensure that national monopolies of rolling stock are not encouraged...".

In his more recent letter, dated 22nd September 2016 he noted that at the Innotrans Exhibition in Berlin the manufacturer Stadler had put on display a new high-speed train with floor heights level with the doors. Figure 14 and Figure 15 illustrate various aspects of this particular train.

Figure 14.The new Stadler HST for SBB with level boarding to ramped internal access. (©Antoine Defossez/ERA)

Figure 15.The internal ramp, interior floor levels and general internal layout. (©Antoine Defossez/ERA and David Haydock)

He states that *"Thus such a design could enable level floor access, as HS2 appear to want, to be provided on 760mm platform heights as allowed in the TSI."* This would give compatibility with the HS1 line.

4 The opinion

4.1 The Agency is of the opinion that the use of a platform height which is different from the INF TSI targets or the existing UK specific case is not justified and appears to compromise the objective of HS2 operating as part of a single integrated network.

HS2 should not deviate from the INF TSI for selecting the height of platforms. They should evaluate the choice between:

- 915 mm, according to the UK national Specific Case in the INF TSI, or
- 550 or 760 mm, according to the target requirements in chapter 4 of the INF TSI, to enable standard TSI conform high-speed trains to be used on the route.

4.2 We believe that the objective of level boarding to the train could be achieved, at least for wheelchair users, from one of those platform heights. This would be at the cost of some internal ramps or steps and a small reduction in the volume available for equipment underframe. .

4.3 We see the HS2 case for ~1200 mm platforms driven primarily by the combination of:

- A "metro-style" service implying a dwell time of 120 seconds at intermediate stations leading to the requirement for level access at all doors, and
- The requirement for distributed traction that is considered the only possibility to achieve the service and run-time performance.

4.4 This leads to requiring for the level circulation within and through the train at an estimated minimum train floor height of 1200 mm in order to pass over the train bogies. In our view this is sub-optimal compared to the options in 4.1 because:

- It prevents level boarding from these trains at any station on the UK conventional, existing UK high-speed and European high-speed networks;
- It would prevent the use of double decker trains;
- It leads to exclusion or restriction on the operation of "normal" TSI conforming trains
- It leads to HS2 having to procure some non-standard trains[20] that will be captive to the HS2 route, and
- By the adoption of their own track-train interface specification it segregates HS2 from the rest of the railway network and appears to conflict with objective of a single integrated railway network.

[20] This may seem in contradiction with the HS2 statement that they want to buy a product "on-the-shelf", but no high-speed train has been operated as a metro so far; the impact on the number and size of doors and on the interior layout will certainly require changes in design that have not been considered by HS2. In addition, no high speed train built on European standards provides access from high platforms.

4.5 We have serious doubts whether the optimum solution to a limited platform capacity at intermediate stations such as Old Oak Common is imposing a 2 minute dwell time to train design, train operation and passenger behaviour. This is because:

- In an intensive high frequency service such as that envisaged through the intermediate stations it is very risky to stake the entire performance of the routes services and by cascade the performance of the UKs entire train service in the hope that 2 minute dwell time will be achieved at such stations all day, every day.
- The reliability of UK infrastructure including new equipment installed on the West Coast Main Line (WCML) does not reassure us that high levels, such as those found in Japan, of infrastructure reliability can be confidently assumed, and
- Dwell time is also influenced by events out of the control of the Engineer or Operator, e.g. a passenger taken ill.

We would urge that alternative solutions with lower potential operating risks to providing platform capacity at intermediate stations are explored.

4.6 Whilst we agree that level boarding can help reducing the dwell time, we consider that dwell time is driven by far more than level access only. Much more significant will be the layout of train interior, location, size and number of doors and the approach to luggage management amongst other things. An innovative and therefore expensive train design solution will be required. This will be made even more difficult if a distributed traction and a continuous floor height of 1200 mm throughout are insisted upon, leaving limited room for discussion with stakeholders who have experience in designing, operating or maintaining high-speed trains.

4.7 Increasing the diversity of railway infrastructure by new projects is implicitly contrary to the public interest both at UK and European level.

4.8 The failure by railway projects to follow the UK rules and the TSIs will export route specific requirements to trains increasing costs and reducing residual value.

4.9 A segregated network/line with highly bespoke rolling stock and infrastructure would:

- act as a disincentive to providing UK to UK through journeys under a competitive framework, act against the interest of the passenger (particularly PRMs) by limiting the possibilities of through journeys, e.g. Manchester to Marseilles, Bruxelles to Birmingham or Leeds to Lille by utilising the existing connections to HS1 just to the north of St Pancras station (note Leeds to Lille would require a reversal in St Pancras International). HS1 was designed and built with such connections and they are currently available for use;
- limit access to specific operators and trains and act as a barrier to competition both for and within the market;
- highly bespoke rolling stock may limit the number of manufacturers available to bid and who can show the capability to supply the rolling stock, and
- be against the spirit and possibly the letter of current UK legislation, the Interoperability and Market Access directives.

4.10 It is and was for these reasons that the Interoperability Directives prohibit Member States from increasing diversity in railway infrastructure. To maintain the integrity of the shared system Member State Governments need particularly to restrict the possible diversity of their railway system's infrastructure so as to create the system benefits that arise when networks are harmonised with one another. We are surprised at the number of projects that have or will increase technical diversity, e.g. Crossrail signalling, HS2 platform height, that then require bespoke (and therefore more costly) rolling stock. The bespoke nature of the rolling stock may restrict the opening of the market for railway vehicles. It is our opinion that the idea of each new infrastructure project creating new system specifications and rules to "export" to rolling stock should be avoided. We strongly recommend that the UK review whether the implicit policy of championing project / route specific proposals to increase system diversity is in the UK's public interest.

4.11 In conclusion, it is our opinion that the best interests of the UK railway and all of its passengers is to use the current UK specific case of 915 mm arl. Given the potential size of the rolling stock order, train manufacturers will come with their solutions that create level access to the train, if not through the train. Some 60% of train services during phase 1 and more than 45% during phase 2 will serve towns and cities off the HS2 network. We believe this approach will allow the new trains to be fully and easily accessible to all users not just those using stations on the HS2 network.

Valenciennes, 13.02.2017

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