

## High speed buffers? HS2 in London (part A)

**Jonathan Roberts 29.3.2016**

### Introduction

High Speed 2 is the Government-sponsored scheme for a new London-Midlands-North express railway. It is intended to add capacity and shorten journey times on the main north-south intercity corridors. It has been around as a politically supported concept since 2008-09, although the 2006 Eddington Report dismissed a high speed line as poor value for money and said the government should instead concentrate on improving existing road and rail networks. Recession and post-recession arguments about capacity and stimulus for economic growth turned that policy corner.

Successive governments, Labour in 2009-10, Coalition in 2010-15 and now Conservative, have backed the proposition – one of few matters to secure and maintain all-party support. The government's designated project company, HS2 Ltd, has developed detailed proposals and undertaken widescale consultation, for a scheme which now embraces about 335 miles:

- Phase 1 trunk line (130 miles) between London, Birmingham and Handsacre, near Lichfield on the West Coast Main Line (WCML).
- Recently-defined Phase 2a onwards to Crewe (~40 miles).
- The bulk of Phase 2, Crewe to Manchester and from the West Midlands to the East Midlands and Yorkshire (another ~165 miles including through spurs to NW and NE England).

This is a large ambition, and was to have included more elements in earlier versions with a Heathrow spur and an HS2-HS1 link.

The preparatory work led to a HS2 Phase 1 Hybrid Bill being lodged in Parliament in November 2013 to seek powers for construction and operation. There was also a paving Act – the High Speed Rail (Preparation) Act 2013 – to allow early start on preliminary elements. The main Bill has just concluded its Commons stages and has entered the House of Lords. During the Commons a major part of the proceedings was a [Select Committee](#), whose work began in May 2014, and continued into February 2016. Meetings extended over 160 days of hearings with nearly 1,600 petitioners. Appointment to such a Select Committee has sometimes been compared to a Soviet posting to Siberia.

### What we are covering

So it is high time for LR Towers to sharpen our pencils since the scheme comes well into LR territory, and for us to provide our usual factual critique, so far as the proposals impact on the London area. We aren't going to enter into the broader case for and against what, if authorised, will be new national intercity high speed tracks through the countryside and some city regions. We shall however look at various elements of the scheme:

(Part A)

- Purposes of HS2.
- Selected route in the London area.
- Demand and capacity case as it affects the London commuting area.

(Part B)

- Particulars at Old Oak and at Euston.
- Different options proposed by other parties.
- What have been the main petitioning points raised in Commons Select Committee.

## Purposes of HS2 - National economic growth objectives

Not to be forgotten, though it can easily be in the large cost envelope of the whole project (£42.6bn for Phases 1 and 2, plus £7.5bn for trains, at 2<sup>nd</sup> Quarter 2011 prices) [the 2015 Spending Review has now inflated numbers pro-rata], is that HS2 is fundamentally intended to be an instrument on a national scale for place-shaping and economic growth. It has the potential for large-scale economic impacts in the Midlands and North as well as London. No-one can pin down the actual outcomes with accuracy, but there is a belief in a trajectory. A summary position can be described as significant capacity released on existing lines, in turn enabling that economic expansion, and while we are at it, let's make the journey times shorter with other connectivity and economic gains. The original LGV (Ligne de Grande Vitesse) between Paris and Lyon had similar origins. The phrase 'High Speed' unfortunately can imply a different underlying policy priority.

Belief or non-belief in an economic trajectory generates considerable light and heat between project promoters and doubters. As shown in the article [The Queen vs DfT](#), the Department for Transport rules out use of wider economic gains (Gross Value Added or similar) for transport business case development, even though GVA is widely endorsed by local authorities including the GLA and TfL, and by the new National Infrastructure Commission. So HS2 has an inbuilt hindrance – or paradox – of a scheme intended to achieve place-shaping, but where those changes can only be modelled indirectly through the nominal economic impacts of changes in journey time and related parallel transport side-effects, these being considered a proxy for the real changes in the economy. It's all rather perverse!

The topic has been underscored by the 'Northern Powerhouse' Chair of Transport for the North Partnership, ex-CBI leader John Cridland, who [stated](#) (on 22<sup>nd</sup> February, the same day as the HS2 Select Committee's 2<sup>nd</sup> Report) that ambitious infrastructure should be on the agenda regardless of any business case shortfall:

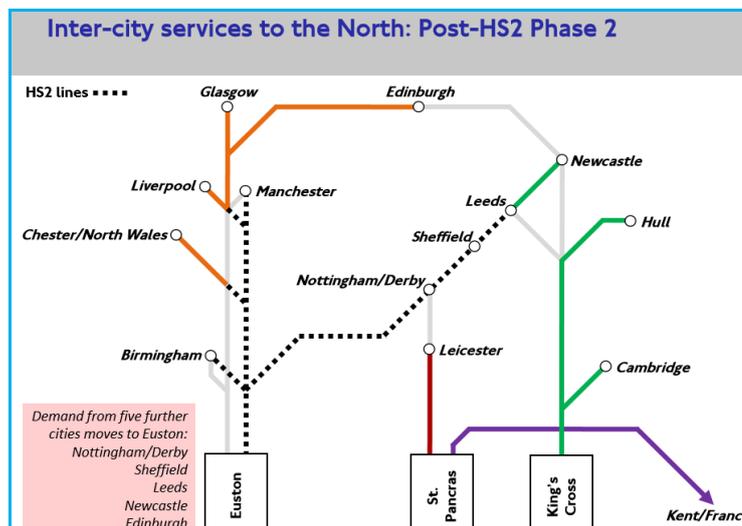
"I'm not claiming there is perfect science here... But I am convinced that after decades of under-investment, it's now time to close that investment gap - and it will lead to better travelling experiences and economic growth... Transport economics can't always prove this: sometimes, like the Victorian engineers, you have to take a leap of faith."

It is not clear how £ billions expenditure on a Northern leap of faith would go down well anywhere else in the UK, except as a 'me too' pork-barrel argument where economic assessments and value for money were temporarily suspended as a methodology throughout Britain. To take valuation matters a little further, the Government argues that in the case of any HS3, or conflation of HS3 and Trans-Pennine upgrade and electrification, economic impacts of what will be a combination of capacity and 'isochrone geography' will be beneficial **two-way** across Northern England – with the 'Northern Powerhouse' effect advantaging the cities east and west of the Pennines.

Logically any equivalent effects will also arise **two-way** with HS2, although that isn't talked about too much, and more political emphasis is given to benefits in the Midlands and North. But surely the 'London Powerhouse' gains too, and with its strong centre of economic gravity you can work out some of the possible implications.

## Purposes of HS2 – Strategic changes to rail capacity in London and the Home Counties

There is a symmetry about the HS2 Phase 2 Yorkshire branch, that matches with Phase 1. They are both about removing the fastest intercity services from the existing lines from London<sup>1</sup> – the West Coast, Midland and East Coast – until they reach the Midlands and the southern part of Northern England. There, through trains would rejoin the classic network, while ‘captive’ services linking the main conurbation capitals (London, Birmingham, Manchester, Leeds) would serve new termini built specially for those trains.



Rerouting the intercity services basically provides additional commuting capacity for the Home Counties and shires to/from London on the existing lines. Outer suburban and longer-distance ‘intershire’ commuting is where a big change in demand is already arising, and is forecast to grow much more in the period to 2043, according to Network Rail’s long term planning forecasts and more recent documentation. The commuting aspects are discussed later in more detail. There is also at least a 50% growth in freight train movements expected on the West Coast Main Line (WCML) – largely inter-modal freight – and growth in regional passenger travel in the Midlands and Northern England.

Whether HS2 is the best way of tackling London’s future needs on these lines, plus new economic growth, will not be discussed. Others have argued for maximum capacity increases to the existing WCML and its train fleets, the Great Central main line to be reopened somehow for freight if not for passengers, 4-tracking Welwyn Viaduct for the East Coast Main Line (ECML), and other interventions. The simple fact is that it is the longer distance intercity flows which are planned to be rerouted via HS2, so with two hits opening up more train slots on three existing main lines. The DfT has published technical reports in November 2015 which argue that further WCML upgrades would be wholly inadequate for that corridor’s foreseen future demand.<sup>2</sup>

There *is* much general acceptance that trying to expand the existing WCML into a 6-track railway from its present 4 (and 8 tracks rather than 6 south of Watford) would be a very difficult task, bringing with it all the risks that were the downfall of the West Coast Route Modernisation’s financial and project management in the late 1990s and 2000s, and contributed to the death of

<sup>1</sup> other than the Great Western.

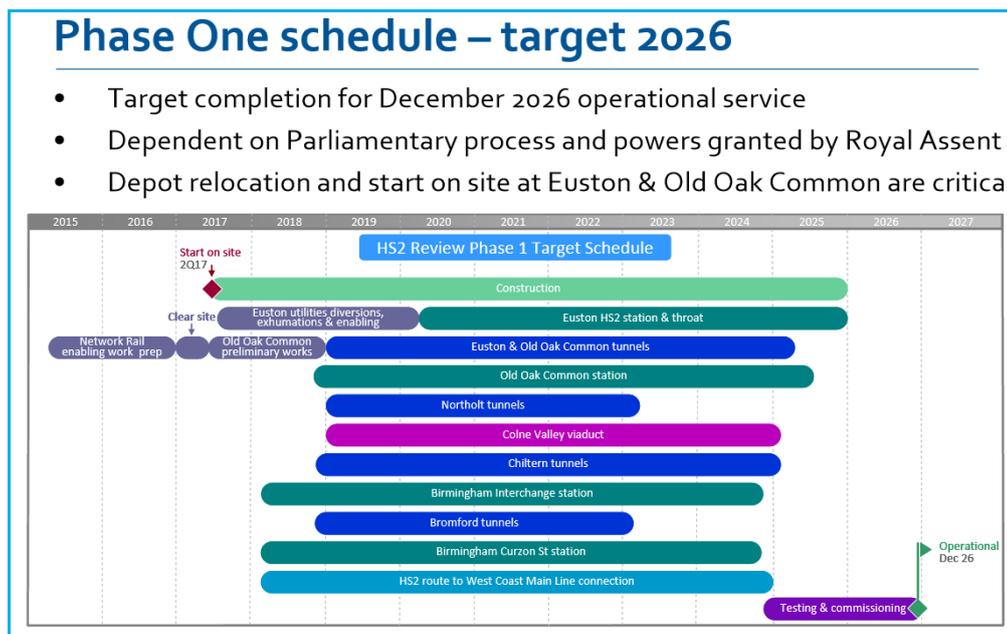
<sup>2</sup> <https://www.gov.uk/government/publications/hs2-supplement-to-the-october-2013-strategic-case>

3 reports: [Supplement to the October 2013 strategic case for HS2](#)

[Demand and capacity pressures on the West Coast Main Line: technical annex](#)  
[HS2 and the market for business travel: technical annex](#)

Railtrack. A £2bn scheme became £9bn, which is about half of the works cost for HS2 Phase 1, while the collateral service impacts during years of reconstruction became part of standard railway folklore.

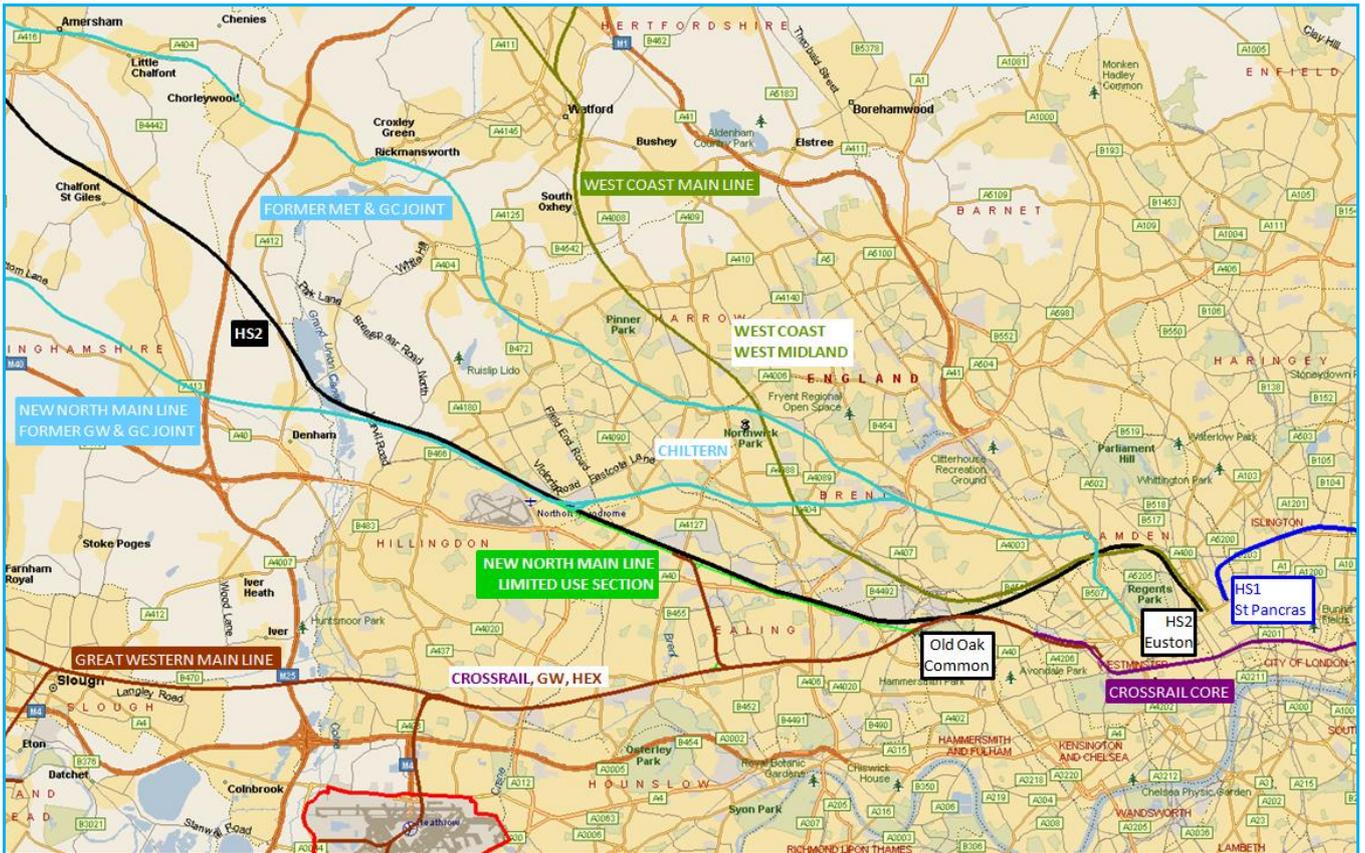
**The essence of the scheme is that HS2 Phase 1 provides WCML tracks 5 and 6, and is intended to open in December 2026. Any early extension to Crewe, perhaps in 2027, would virtually complete the HS2 impact on the WCML, irrespective of any later authorisation of links towards Manchester and/or Liverpool. HS2 forecasting should take in account this non-linear impact on demand and capacity requirements from what at first sight appears to be a ‘modest’ Phase 2a. The construction timescales foreseen in March 2014 in Sir David Higgins’ HS2 Plus report, for HS2 Phase 1 including the London area, are set out below:**



### HS2 route in the Home Counties

Before the HS2 Phase 1 Bill was submitted to Parliament in November 2013, there was wide ranging optioneering about the preferred route to approach the London urban area. Whichever way you pointed, you were going to meet the Chilterns, which in practice extend in an arc all the way from south of the Goring Gap (Great Western Main Line) to east of the Luton Gap (Midland Main Line). This was bound to incur strong objections, and was likely to involve a commitment to tunnelling on some scale.

The route finally selected sought to take advantage of the underused and relatively straight railway corridor within NW London, the former Great Western & Great Central (GW&GC) Joint Line – also known as the New North Main Line (NNML) – which opened in the 1900s as appropriately enough the Edwardian high speed railway between London and the West and East Midlands. The first part of this line was opened in the London area in 1904. The last section, from Ashendon in Buckinghamshire to Aynho near Banbury, opened in 1910.



**HS2 route and other main line rail corridors in West and NW London**

The GW&GC corridor informed the eventual choice of HS route through the Chilterns, which follows much of the Misbourne Valley, shunned on the Denham-Amersham section by previous generations of railway builders. Amersham itself was only reached by the 1892 Metropolitan Railway extension from Chalfont to Aylesbury, which in reality was another railway encouraged by its forceful Chairman into paying for part of the 1890s Great Central extension to London. He also chaired the Great Central, South Eastern, Channel Tunnel and Nord Railways, and wanted to create a Manchester-Paris Main Line. The GCR was built to a smallish continental-sized loading gauge. History is now repeating itself.



**HS2 shown diverging from the New North Main Line over the Colne Valley**

In the Home Counties, therefore, HS2 is planned after its London tunnel to diverge from the GW&GC corridor east of Denham, cross the Colne Valley with a brief glimpse of light, then back into a long tunnel to near Amersham, then with much cut-and-cover 'green tunnel' and deep cuttings for environmental protection reasons towards Wendover. In the Vale of Aylesbury and beyond, HS2 would parallel the Met and GC to near Brackley in Northants, physically using the GC alignment north of Calvert, then follow a new route past Daventry to the West Midlands. However, no commuter stations are planned on this section of line, which is a cause of mixed opinions in the commuter territory served. HS2 Ltd is clear why this is, the railway is intended for intercity flows, and line capacity would be lost by trains slowing and accelerating to serve intermediate stops. This view has prevailed so far during the passage of the HS2 Phase 1 Bill.

### Choices within London

The GW&GC corridor points within London towards Old Oak Common (OOC), which is where the Great Western Main Line is met. OOC provides the opportunity for a direct interchange with the GW and with Crossrail 1, the latter being important to allow a one-stop interchange for the City and Canary Wharf, which helps to relieve passenger flows at Euston, as well as providing access to Heathrow Airport (discussed below).

The GC entry to Central London, which is quite curvaceous and graded, leaves the NNML at South Ruislip towards Neasden, and is used fully by Chiltern Line services. The NNML southwards is hardly used these days. OOC was therefore the logical next location along the corridor, along with the original ambition of surface running on the London side of South Ruislip. Several options and complications then arise:

- Design criteria for HS2 and effect along the NNML route.
- Choice of access to Heathrow Airport.
- Choice of access to a London terminus.
- Any access within London, other than via a London terminus.

### HS2 design criteria and effect on NNML route

The HS2 line design specification is for up to 400 km/h (about 250 mph), and for 'captive' inter-urban trains (London, Birmingham, Manchester, Leeds) to be a 'GC' European loading gauge dimension. A build of 'classic-compatible' trains will also be required for intercity trains running onto the existing network. More detailed information from HS2 Ltd is that the trains' intended maximum speed on a day-to-day basis will be limited to 360 km/h, with the timetable scheduled at 320-330 km/h (about 200 mph), which is now a European HS norm. The 360 km/h upper limit gives a margin to recover from perturbations. The main tunnel design on HS2 will be single track bores: 7.55m diameter for line speeds up to 230km/h, and 8.8m diameter for speeds up to 360km/h, and for tunnels over 1 km long the provision of evacuation facilities which includes a safe area. Typically 'porous portals' are required for line speeds of 230 km/h and above because of the piston effect.<sup>3</sup>

There is a debate to be had about the merits within the UK of large-gauge 'captive' trains, which will **not** be double-deck (too much delay with boarding and alighting at intermediate stops, apparently). A high-density 3+2 seat formation is being considered by HS2 Ltd for the 'captive' shuttles to maximise passenger capacity while maintaining some degree of comfort. This because there is a significant HS2 Ltd worry about potential passenger demand vs line capacity. However it

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<sup>3</sup> [https://www.whatdotheyknow.com/request/tunnel\\_design\\_and\\_speed#incoming-753215](https://www.whatdotheyknow.com/request/tunnel_design_and_speed#incoming-753215)

might be advisable for HS2 to check out the views of, for example, Portsmouth Line users, about the ambience of their 3+2 Desiro 450 journeys on 50+ minute services, compared to the previous 2+2 seating on Desiro 444s. It would be a bit downbeat to travel at 200 mph in an inner suburban seating environment undesirable even for today's scale of obesity, even if many of HS2's passengers were commuters.

Any 'GC' trains would be only marginally wider than UK-size carriages, 4ins at best. The standard 26m-long UIC passenger coach has to be no more than 2,825mm wide. The late Gordon Hafter, London Underground's rolling stock engineer, noted that "for the imperially minded that is 9ft 3ins, which is (surprise) exactly the overall width over door handles on a BR Mk 1 coach". He observed that "It is only at the bogies, where there is no throwover, and generally below platform level, where the BR gauge is even narrower, that coaches built to UIC gauge can be noticeably wider, which is why the Trans-Manche Supertrains [the first Eurostar design] have had to have their bogies radically redesigned from those used on the TGV-A trains, although the car-bodies are literally but a few millimetres smaller, at 2,814mm according to the published drawings."<sup>4</sup>

HS2 Ltd believes that a standard off-the-shelf European train could be cheaper than a product modified for the UK loading gauge, although many such trains would be needed for 'classic-compatible services'. The proportions foreseen by HS2 Ltd are 16 'captive' and 45 'classic compatible' trains for Phase 1 (61 in total), and 70 'captive' and 95 'classic-compatible' for a full Phase 2 (165 in total, with 104 additional)<sup>5</sup>.

Several manufacturers, based on direct discussions, consider that 'classic compatible' 360km/h trains can be achieved, though 400 km/h is likely to be a challenging design because of the energy and power demands at that speed, requiring larger equipment – but which is not currently required by HS2.<sup>6</sup> So why would a 360km/h 'captive' build make any procurement sense or value for money, least of all with Phase 1 or Phase 2a when the vast majority of trains will need to be 'classic compatible'?

The greatest impacts of design speed and train sizes are on the railway infrastructure. Under European regulations, whether or not it is an HS line, new non-metro lines must be built to a European loading gauge, subject to derogation in reasonable and proportional cases such as the new chord at Bicester. For example the reopened Borders Line is GC gauge with some lesser derogations in place (eg UK platform heights and platform gap from the rail), and was generally built to the latest engineering and passenger access standards.<sup>7</sup> Smaller loading gauge trains may use European-gauge lines, subject to addressing matters such as the relationship between the trains and strictly specified 'GC' platform clearances and heights – accommodated on the first generation Eurostar and Regional Eurostar trains (an example of a 'classic-compatible' design) though not necessarily a 'step-free' solution.

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<sup>4</sup> Source: <http://www.railway-technical.com/index.shtml> . Gordon Hafter recalled there, for the historical record, that the late-1930s 'Cornish Riviera Limited' stock within the larger GW rolling stock gauge was 9ft 7½ins or 2,938mm wide, more than 100mm wider than today's standard 26m-long UIC coach, albeit only about 19m long.

<sup>5</sup> From HS2 Circulation and Stabling Plan 2013.

<sup>6</sup> Manufacturer communication 16 June 2015: "The necessary space would simply be created from a reorganisation of the underframe components and the removal of the redundant engine and fuel tank which would not be needed for the HS2 application. We believe this is the most cost effective solution for the HS2 classic compatible fleet as the gauge and performance would match the current IEP fleet outside the dedicated HS2 network." Another manufacturer (23 July 2015) thinks it feasible to achieve 360 km/h with 'classic compatible' trains and underfloor equipment, but it could be a packaging challenge for 400 km/h with 'classic compatible' trains because of the larger increase in required power.

<sup>7</sup> Communication from Network Rail Scotland. European Technical Specifications for Interoperability (TSIs) are a suite of specifications that outline the design requirements for new build and modified railways. HS2 is designed to comply with the relevant TSIs.

Grandfather rights apply to existing main lines with smaller loading gauges, such as the bulk of the existing UK network. Otherwise there could be the logical nonsense of no through running back onto the 'classic' network. There would be little benefit from HS2 Phases 1 and 2a if infrastructure changes for through HS trains became prohibitively expensive and railway standards blocked through services to Manchester, Glasgow etc as long as those cities were excluded from the new HS new lines. However if an existing UK line were upgraded significantly, the new TSI requirements might be expected to apply (again subject to derogation).

In the London area, in theory the NNML could be used by HS trains between Ruislip and Old Oak Common, with electrification, upgraded tracks and signalling, providing that only 'classic-compatible' trains were used, and relevant TSIs adopted if required. The NNML used to be 4-track on part of the line through Ruislip shared with Chiltern. There would be a similar opportunity to share tracks on the approaches to Euston and other conurbation termini.

However the adoption of a very high speed specification (faster than intended to be used at present) and European gauge 'captive' trains, forces a requirement for new line specification all the way to the buffers at London, Birmingham, Manchester and Leeds. Not cheap, with shades of a Brunellian broad gauge effect including 'change of gauge' impacts at major cities and on major corridors that might not see through HS trains even as UK economic and population growth improved the case for more through-running services.

It is acknowledged that many present intercity services are a city-centre to city-centre only offering, but they often call at towns and cities elsewhere en route, eg at major interchanges, whereas HS trains wouldn't because of the route and service specification. Essentially HS2 has adopted a Japanese stand-alone style of HS offer, rather than one of the other options such as the French HS radiating services structure or the integrated 'neubaustrecke' extra HS lines and junctions joining up with many existing networks and city centre stations, as preferred by Germany and Switzerland. The UK of course doesn't have other European-gauge city centre approaches, except for HS1 to St Pancras International.

The 22<sup>nd</sup> Century population may yet applaud 400 km/h operability, just as we benefit from Brunel's 19<sup>th</sup> Century foresight or wastefulness (take your choice). 21<sup>st</sup> Century Treasurers and financiers might prefer something less exciting and more affordable, incremental, and nearer in line with what much of Europe has already settled on. That could affect the final HS2 train order – maybe full dimension trains, eventually ...? The Dutch had a saying in 1940 – we like you Germans but we don't want all of you at once.

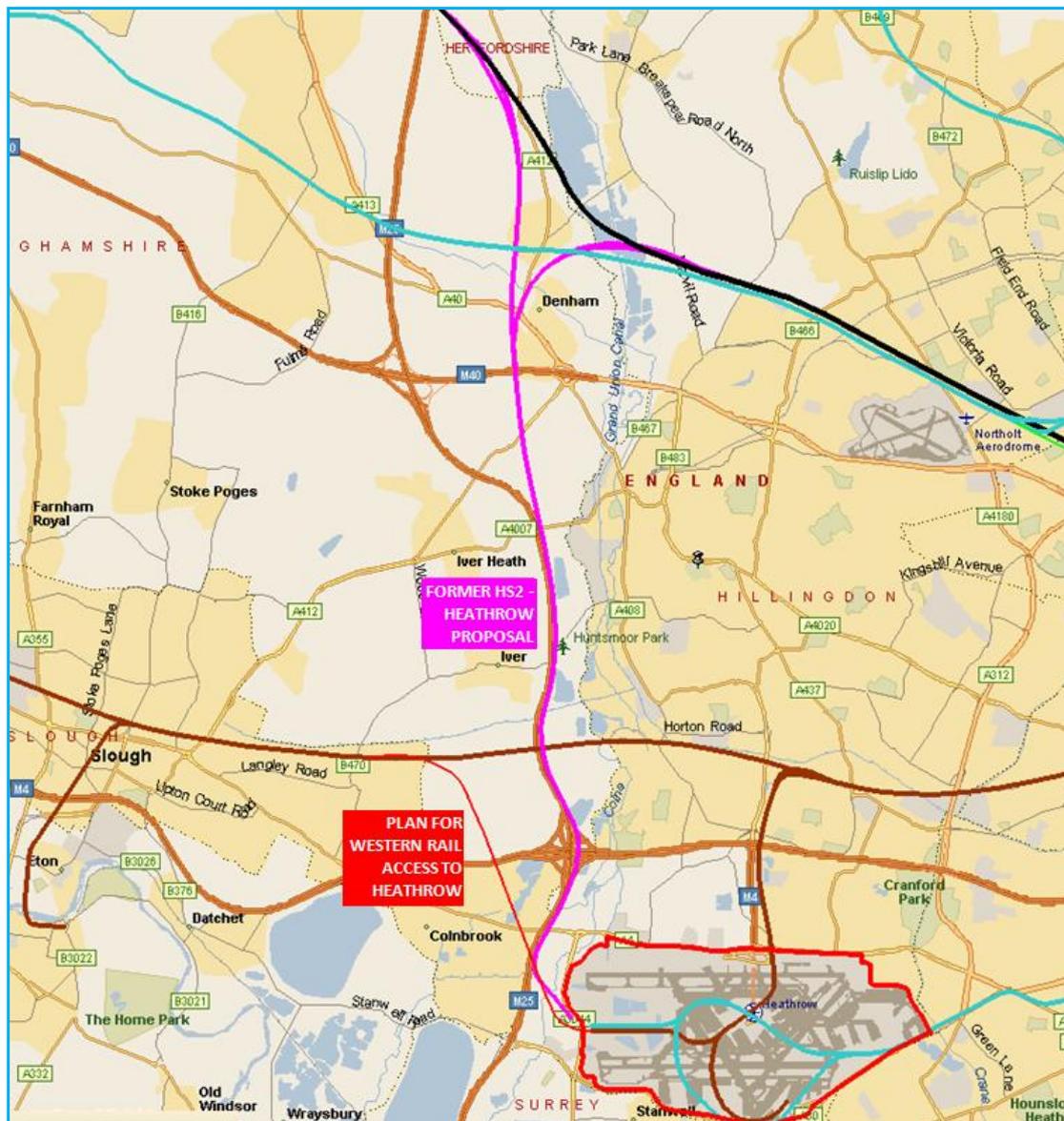
Adaptation of the NNML was originally proposed on the non-GC section south of South Ruislip to near OOC. However according to HS2 Ltd the net cost of tunnelling all the way wasn't much different to an adapted and TSI'd NNML rebuilt to 'GC' dimensions, while the timescale for tunnel construction was acceptable. It also avoided many local environmental concerns about the noise and other impact of very high speed trains operating along a corridor no longer familiar with having an express railway on their doorstep (albeit the adjoining Central Line is a frequent service). The impact had been a significant petitioning point by the GLA and TfL irrespective of the fact that the debated section of railway now falls within and adjoining the parliamentary constituency of Uxbridge and South Ruislip (Boris Johnson MP since May 2015). Other NNML constituencies are Brent Central, Ealing Central & Acton, Ealing North, and Ruislip Northwood & Pinner.

So there is now the paradox of an under-used surface main line railway corridor in a congested London, the GW&GC Joint Line/NNML, which has influenced the location of HS2, yet on present plans will remain under-used with the new high speed railway in tunnel below it all the way to

near Old Oak Common. The NNML is potentially also interrupted in some locations while HS2 tunnel ventilation and escape shaft works are undertaken. The involvement with the NNML of the proposed WCML-Crossrail 1 link is discussed later.

### Access to Heathrow Airport, and implications for HS2 service options

It was desired by Midlands and Northern stakeholders to be able to reach Heathrow via HS2, to open up fast access to this major international hub. The [Heathrow Hub](#) campaign has argued, so far without success, for the main HS2 line to be routed via the airport on its way to London. Heathrow Hub has also advocated that use of the HS2 main line within London could allow some European rail expresses to start and terminate at Heathrow rather than at St Pancras. It has alternatively argued for widening the GWML to six tracks as far as Iver, with people movers serving a new Hub station there and with European rail expresses reaching the airport that way.



HS2 and Heathrow

The Government commissioned a report in March 2010 from Lord Mawhinney (a former Conservative Transport Secretary).<sup>8</sup> This covered four topics: HS to Heathrow, a London HS terminus, airline slot allocation, and a link to HS1 and mainland Europe (rather more than he was asked to do). Mawhinney reported in July 2010 and recommended in relation to Heathrow that:

- in the early stages of a high speed rail network, there is no compelling case for a direct high speed rail link to Heathrow, and an Old Oak Common interchange is adequate
- changing the route of the main HS line to run via Heathrow, at an extra £2-4 billion, should not be taken forward
- rail/air through ticketing to be an integral part of any new HS rail link to Heathrow
- with the HS line from OOC to Birmingham, appropriate junction engineering works should be included to allow an eventual airport link – a direct line would only be in prospect after the HS network had been extended at least to Manchester and Leeds
- he favoured a station at Heathrow Central Terminal Area for maximum connectivity.

The Government had also said that Heathrow Airport should make a funding contribution towards the spur railway. HS2 Ltd proposed a spur from near Denham, generally alongside the M25, to a terminal near Heathrow T5 (see map). In one future option, that could have been extendable in the longer term towards the South West Main Line as part of a Southern Rail Access for Heathrow, and so offer HS cross-country intercity trains from places such as Southampton. The HS spur would have had two junctions with the HS2 main line, one towards the Midlands and North, and one towards London. The latter would clearly have had an onward link in mind with HS1, discussed below.

In terms of service planning, the HS2 main line is seen as having slots for 18 tph each way, running at consistent speeds to maximise hourly capacity. 18 tph is equivalent to a train every 3.3 minutes, or every 3 minutes with a 'white space' every half-hour to allow a recovery and punctuality margin. Of those, HS2 Ltd had foreseen 16 tph between London and the Midlands/North/Scotland, and slots for 2 tph between Heathrow and the Midlands/North/Scotland. That in turn would allow up to 2 tph on the Heathrow-London curve, with a Heathrow arrival from the Continent using the same HS2 main line slot as a Heathrow departure for the North, and v.v.<sup>9</sup>

As we shall see, the HS2-HS1 link has been cancelled, making the London-Heathrow spur partly irrelevant for the next couple of decades. The Heathrow-northbound spur was then questionable, though both still had potential relevance for any decision on an extra South East airport runway. On Government instructions in January 2013, planning for the spurs and Heathrow rail link was deferred until after the Airport Commission's announcement due in 2015.<sup>10</sup> HS passengers to/from Heathrow will have to travel via OOC, as proposed by Lord Mawhinney.

The forecast passenger volume to/from Heathrow was itself quite low (as opposed to any HS cross-country linkage which had been backed in 2010 by pro-HS [Greengauge21](#)). Only 2 tph were considered justifiable, making the whole HS spur poor VfM. The decision releases two

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<sup>8</sup> <http://webarchive.nationalarchives.gov.uk/20110203043906/http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/lordmawhinneyreport/> Lord Adonis when Transport Secretary commissioned Lord Mawhinney in March 2010 to assess the various options which had been put forward for a high speed station at or near Heathrow and the business cases in support of those options, and to provide advice on whether and if so when a high speed station at or near Heathrow might be needed and where it might best be situated. The review was to take place within the context of government policy which then included a proposal to build a third runway at Heathrow. Following the May 2010 General Election, the new Transport Secretary, Philip Hammond MP, confirmed continuation of the review in the context of the new Government's policy not to support a Heathrow third runway.

<sup>9</sup> From a discussion with Professor Andrew McNaughton.

<sup>10</sup> <http://assets.hs2.org.uk/sites/default/files/inserts/130116%20heathrow%20route%20description%20for%20ehs%20final%20policy%20approved%20text.pdf> This includes a route map of the HS2-Heathrow line.

additional slots per hour for internal UK high speed travel to and from London, which may be much more worthwhile commercially. In May 2013, after the shelving of the HS2-Heathrow link, Greengauge 21 suggested using [NNML and the HS2 spur](#) from the London direction, for other rail services to reach Heathrow. However that is no longer an option. While the alignment might be useful to note as a possible future corridor for orbital London & Home Counties travel and/or for London-avoiding trains, the spurs are not being safeguarded. The Commons Select Committee has explicitly directed the Promoter not to use the Bill powers to implement passive provision for the Heathrow spurs.<sup>11</sup> The Government accepted this.

It is unlikely that HS spurs will be revived in the foreseeable future unless the Scottish Government insist on a link to allow Scotland-Heathrow HS trains as an environmental alternative to planes. These are not in the HS Scotland and Northern England plans published in [March 2016](#).

### **Franchising and open access**

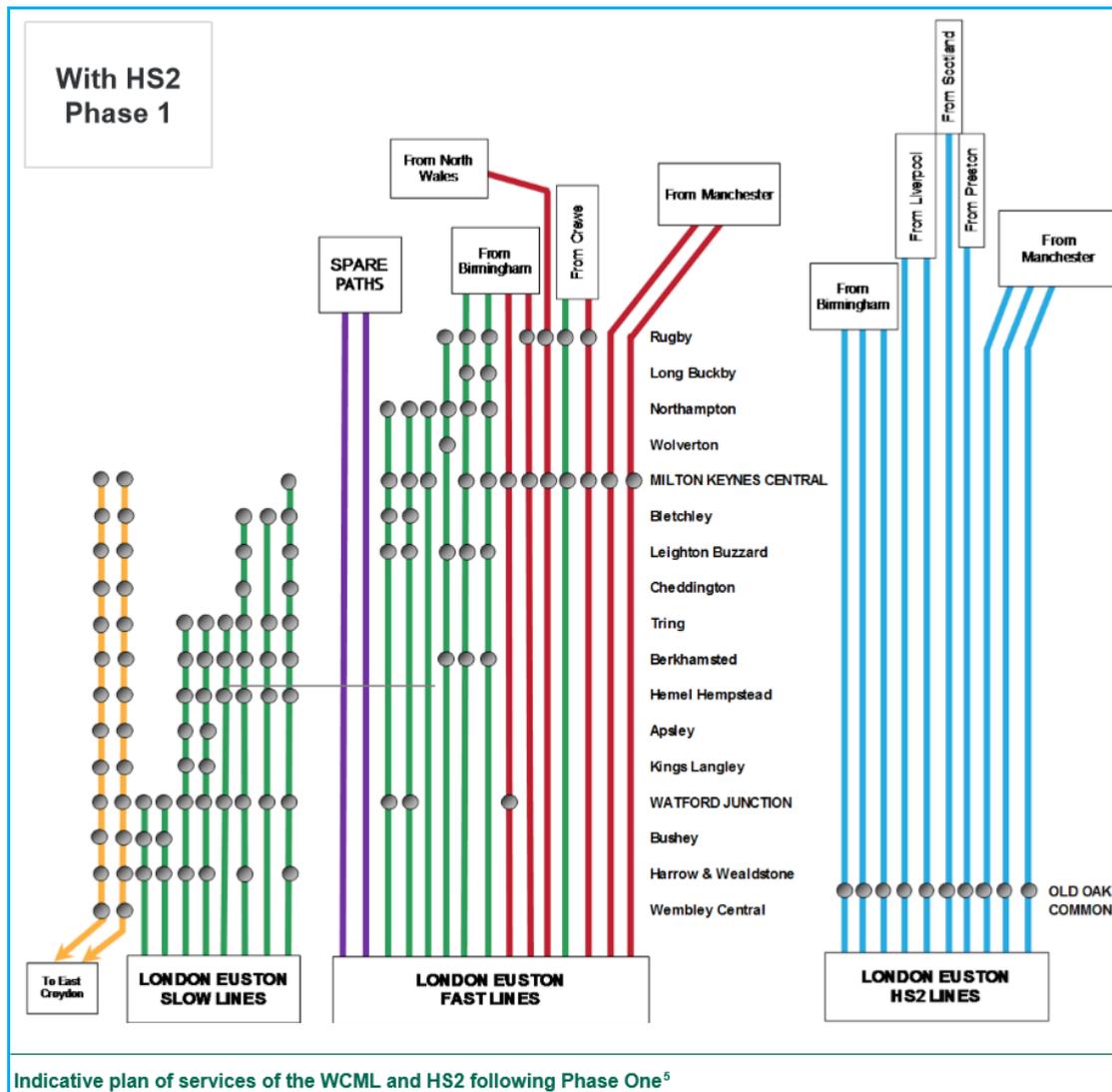
As a corollary, might those two (or more?) HS2 slots per hour become available for open access trains? No one has so far mentioned the availability of HS2 to accommodate open access services, but legally the possibility must exist. HS line capacity will not be used fully in Phase 1. Indeed no one has so far indicated how the HS2 services might be structured within or separately from the existing WCML franchise as a commercial operating package, or as a 'super-express' element of the established West Coast and East Coast franchises.

Nor has pricing for route access and train paths been debated much, neither for 'captive' services between the main city-centre hubs nor for through expresses continuing onto the classic network. These are rather fundamental questions which are still open for large-scale debate. HS2 has proposed a draft group of HS2 Phase 1 services, along with WCML replacement services, but that's as far as it goes at present.

The latest DfT demand case analyses for HS2 were published in November 2015<sup>12</sup>, and show the proposed Phase 1 service patterns. These do not include the Watford-Euston DC trains:

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<sup>11</sup> Select Committee 2<sup>nd</sup> Special report, para 155, page 44.  
see 2 & <sup>12</sup> <https://www.gov.uk/government/publications/hs2-supplement-to-the-october-2013-strategic-case>



### Future services and new operating costs

Broadly the current WCML intercity frequencies are retained and transferred to HS2 (with Liverpool rising to 2 tph, at present in peaks only), except for the hourly North Wales diesel service retained on WCML (of course North Wales is arguing for line electrification). With an approx 50 minute run time between London and Birmingham and 3 tph, an HS2 'captive' train ought to be able to 'cycle' every 140 minutes, 160 minutes at worst. HS2 is planning on a standard 25 minute turnround at Euston except for the longest distance trains. This layover seems excessive for a Birmingham shuttle, but would point to Train 1 resuming at Euston as Train 9 160 minutes later, so 8 trains on that service. As HS2 is proposing an order for 16 'captives', this also points to the bulk of Birmingham trains being planned with the ability for expansion to double-length (400m) for higher capacity, with higher running costs but no more train slots and more seats per train.

Consequently HS2 train operating costs *per seat mile* might not be so startlingly different to now, though energy consumption will be significantly higher. It is the re-growth of WCML services where the additional train frequencies arise: 2 tph new 'intershire' services (our phrase) from Manchester, 2 from Birmingham, another from Crewe plus two hourly spare paths. The outer and inner commuter services from Northampton and from Milton Keynes or closer in

would maintain their frequency (6 tph Northampton, 8 tph MK and closer) and all these would move to 12-car trains over time.

How much these services will reward the combined capex and opex for a revised WCML plus HS2 Phase 1 is an unanswered question. To require roundly £20bn for capex for the Phase 1 line and trains at 2011 prices leads to an annual capex interest charge of £600m (equivalent at, say, a public sector 3% pa borrowing) before any capital payback. As with Eurostar, the capitalised interest before the HS line opened would also be large, at crudely £2¼-3bn, with a further £80-90m interest chargeable annually.

Taking additional WCML operating costs as a nominal £30 per train mile for an amalgam of continuing 11-car Pendolino and 12-car 110mph Desiro equivalents, and some high-level mileage estimates<sup>13</sup> adds a further £350m to opex, leading to more than an additional £1bn revenues required annually just to break even on HS2 capex interest and extra WCML opex. This also assumes that HS2 pays its way on opex, though it might not initially. To achieve a repayment of £20bn HS2 capital investment in say 20-30 years on a mortgage-type basis, one would be looking to another £½bn+ revenues p.a. as a static repayment over 27 years. This is for HS2 Phase 1 only. If you were looking for economic growth as your payback, then sums can be different. They are ultimately a decision for HM Treasury about the balance of financial merit. Most recently, Transport Minister Robert Goodwill has said that HS2 will remain in public ownership until there is “certainty” on operation and passenger numbers.<sup>14</sup>

### **What is the foreseeable demand?**

This leads to the obvious question, about what the volume of demand will really be, and, particularly as it affects rail planning in the London area, what sort of demand, and what should HS2 and a revised WCML really be offering in the nature of future service structures to and possibly through the London area?

You end up with a circular argument if you aren't careful, with rail schemes which project present demand trends self-defining their solutions even though we are looking at several decades of dynamic demand, population and jobs growth, where there may be more than one way to define the optimum end state in say 2040 or 2050 or later. Why a London terminus at all is a question at one end of the spectrum, why not a new terminus is another. Meanwhile the rail industry has already considered one through running option for some WCML commuter services (Crossrail 1 – WCML link), and others may be feasible over several decades. Let's start with why a terminus at all.

### **Why the likelihood of an HS terminus?**

This is best explained by consideration of the alternatives and their present state of maturity, including the former HS2-HS1 scheme. A distinction should be drawn between HS 'captive' services, 'classic compatible' services with the capability for sharing tracks with conventional UK trains, and the foreseen WCML service offerings, where conventional inner and outer commuter services and new 'intershire' services will be the main groupings.

Travel volume points to the London urban area being by far and away the biggest single source of intercity rail travel demand in the south of Britain, though there is also much that is

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<sup>13</sup> 320/365 days x 16 hours x miles ((2 Manchester)+(2 Birmingham)+(1 Crewe) + (2 future slots say Shrewsbury/Blackpool) and return) x £30 ~ £350m.

<sup>14</sup> [http://www.morningstar.co.uk/uk/news/AN\\_1458747432625565400/hs2-rail-link-will-be-run-by-state-before-passing-to-private-sector.aspx](http://www.morningstar.co.uk/uk/news/AN_1458747432625565400/hs2-rail-link-will-be-run-by-state-before-passing-to-private-sector.aspx) [click on 'individual investor' to access the article]

generated by the Home Counties, not least south and east of London. The scope for through links with European mainland railways is also material, even if 'Brexit' type attitudes, UK border policies and the Channel Tunnel safety rules are administrative and political obstacles to the business case for through continental services extending further within Britain than the London area (where a line to Heathrow at least has some rationale).

It needn't have been like that. The original London-Folkestone 'King's Cross Bill' promoted in the late 1980s allowed through running with a tunnel via South London arriving just east of King's Cross terminus with a through station offering links to existing main lines. This 'HSO' would have been able to accommodate through intercity and London & Home Counties regional trains, and also with direct City and Victoria trains rejoining the Southern network near Peckham Rye. It would have been relatively easy to reach North and NW London, though line capacity problems would have arisen in due course with the growth in commuting volumes.

This part of the Bill was quashed in October 1991 in an announcement at the Conservative Party conference at Blackpool, even though it was navigating the Commons' procedures at that stage. The announcement followed strong lobbying from East London interests and Arup who had designed a route via Thames Gateway. There was also electoral nervousness by the Major government about the Bill's impact on marginal Conservative constituencies in SE London ahead of the 1992 General Election. The changes led to BR Chairman Sir Bob Reid 2's famous "Pantomime" comment.



**Willy Rushton's 'Pantomime' cartoon**

*Original owned by the author*

The revised Channel Tunnel Rail Link scheme – still called the 'Union Railway' project – used the original BR route through most of Kent, but then diverted via Ebbsfleet and the route we know. Most of the argued-for local regeneration stations in the Thames Gateway were NOT built, and even Stratford International was an afterthought given powers under a Transport & Works Order after further strong local lobbying. So only in its margins was it initially a regeneration railway. According to correspondent 'Graham H', the Environment Secretary Michael Heseltine

failed to ensure that continental trains were then required to stop there. They never have called. GH also advises that Heseltine wanted HS1 to terminate at Stratford.

The biggest change in principle of all was that the line ended not at a through station but at buffers, at St Pancras rather than Stratford. The story is that Union Railways led by John Prideaux had designed a new through station in the then vacant railway lands north of Kings Cross/St Pancras, pointing towards the WCML, but the BR Board decided [JP was on holiday] to adopt a link into St Pancras, and to allocate St Pancras's refurbishment costs to Union Railways. (Shades of Euston, as we shall see.) The then Transport Secretary, John MacGregor, announced on 22 March 1993 that the Government preferred a lower cost option terminating at St Pancras (with the line then expected to be on the surface from west of Dalston), rather than continuing underground from Stratford towards the former BR proposed interchange station at King's Cross low level.

### HS2-HS1 – the poor value link that died

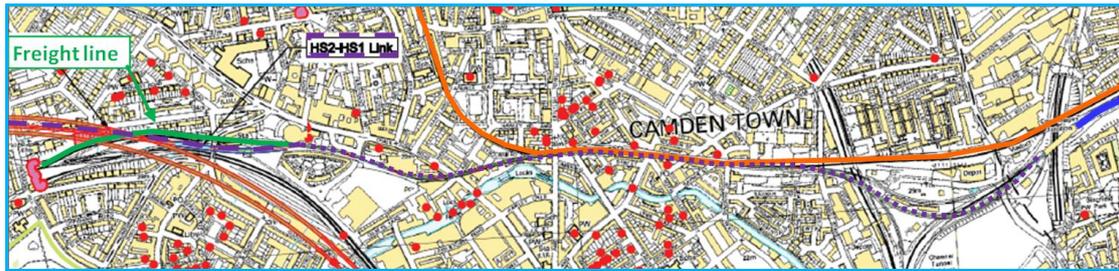
Fast forward to HS2. While the final version of the St Pancras HS1 line created a low speed single track chord (capable of upgrading to double track) to join the HS1 London tunnel portal with the North London Line (NLL) east of Camden Road station, this has remained mothballed. Nor was the NLL the ideal connector for HS2, as major works would be required if it were to become a corridor with frequent services other than NLL and through freight trains. Nor was it HS2 Ltd's intention to offer through expresses to serve Stratford and Ebbsfleet, even though East and SE London, and East Anglia and Kent, are fast growing catchments with 8.6m people, which is 16% of England's population and comparable to Greater London's catchment as a whole.

This left the desire by Midlands and Northern cities for direct European rail expresses. A policy requirement for a link to HS1 was therefore willed upon HS2 Ltd, on political instructions. Shades here of the Section 40 requirement for Regional and Night Eurostar services imposed on British Rail with the original Channel Tunnel Act 1987.

With the available railway geography at Old Oak Common, this required a new through railway if journey times were not to be glacial. This emerged in the original HS2 scheme as a compromised £900m HS2-HS1 link: a new *single-track* tunnel between Old Oak Common and Camden Roundhouse, mostly paralleling the main HS2 Euston tunnels, then via a slightly upgraded existing North London link (between the WCML and the North London Line) whose current running speeds are 15-20 mph in places. European expresses would then share tracks with through UK ports freight and the expanded frequency North London Line through Camden Road station, and finally diverge via the mothballed link to reach HS1 at its tunnel portal. The overall alignment is shown below, and then the detailed corridor on the surface section through Camden.



HS2-HS1 outline of proposed link in 2010



**Camden Local Map showing HS2-HS1 surface section**

*Base local map reproduced from HS2 material under Open Government scheme*

This was not a minor scheme. If it was desired to allow full ‘GC’ European gauge trains, the NLL would also need rebuilding for these larger loading gauge trains or with an additional track alongside the NLL. TfL was directly concerned that the combined impact of even infrequent European passenger trains would knock out additional NLL Overground capacity, then already growing fast in volume. Even if a slot were used only once every few hours, it would have to be protected on an hourly basis in each direction. TfL also estimated that only one NLL path an hour was realistic to be allocated to HS2, even if it was attempted to ‘flight’ European trains in groups to match the single track’s capacity.

The same problem arose for UK freight flows, on an operating section of the main UK railfreight network, where as it is currently structured the Camden Road-Roundhouse-Camden Junction section is available as a supplementary holding loop to manage the punctuality of en-route freight trains (though the main location is Wembley yard).

Capacity, gauge widening and environmental mitigation works were pointing to well over £1bn costs for HS2-HS1, for possibly only a few trains a day in early decades of operation, though HS2 thought construction costs would be lower. The business case for direct European expresses was very poor, as assessed by HS2 Ltd, even on their costs. Low cost jet fares could be contrasted against long journey times by rail, with poor train and train crew utilisation, border delays into the UK, and trains which might need 500-600 paying passengers to justify their commercial existence. This wasn’t a good marketplace to be in, equivalent to one train having to compete against a frequency of three jets at 150-200 pax per flight, and also (UK border rules) no intra-UK flows permitted on such trains. Alternative alignments and longer tunnels were investigated, to avoid the NLL section, but offered little operational benefit for HS2 Ltd nor net environmental benefit for the local community.

Eventually the Government bit the bullet following Sir David Higgins’ HS2 Plus review (March 2014), and accepted that spending such scale of money wasn’t worth it. The link has been deleted from the HS2 Phase 1 Bill, through Additional Provision 3 (AP3). The Commons Select Committee has said (paras 252-254) that:

“252... The House’s instructions to the Committee included a specific instruction not to consider petitions on whether there should be such a link.  
 253. The economics of cross-continental rail travel and modal shift from aircraft use are complex. The question of a continuous fixed link between HS1 and HS2 was outside our remit. We do not comment on it save to express a view that the success of and need for a national high-speed network is not necessarily contingent on a fixed link to the international network. Journey patterns are complicated.  
 254. Quick and comfortable ways to get between HS1 and HS2 will nevertheless be needed. Euston and St Pancras are some 800m apart. A tunnel between them could run under roads parallel with Euston Road, arriving in the northern part of St Pancras. The coherent design plan we have suggested as an imperative for Euston should include convenient ways to get between HS1 and HS2.”

So the immediately available and lowest cost HS2-HS1 link may be a heated, covered footpath, with porters assisting, between Euston and St Pancras International. The Government has ruled

out powered links such as a travolator tunnel because of concerns over vibration damage to instrumentation at the Francis Crick Institute. Crossrail 2 would provide the first opportunity for such a powered link (it has to circumnavigate that damage risk as well!). At least train passengers could connect tolerably well, between **all** European and Midlands, Northern and Scottish intercity trains, at close-by stations.

HS2-HS1 isn't absolutely dead as a long term possibility, in some form, but it's clear that any future link beyond Old Oak Common will have to enable London & Home Counties travel in order to start to make a decent business case, with any European rail expresses as a bolt-on extra where selected slots are preserved for their use. A JRC report in October 2012 which looked at opportunities for improved London & South East commuter corridors highlights this: [East and South East London Partnership report on HS2-HS1 and Stratford International](#). Greengauge 21 looked at a rather different context, including joining UK high speed services rather than standard commuter trains in order to try to justify a link between [HS2 and HS1](#) (GG21 May 2013 document). Again it was joined-up near-London domestic services which had a potentially worthwhile case, not through continental trains.

So we can now answer the first question, about why a London terminus at all? The answer is, because decisions taken in the aftermath of the King's Cross Bill took a narrow view about:

- the possible scope for onwards through trains, north and west of London, as opposed to interchange at London's Northern main line termini
- the business case requirement set out in several studies, for London & Home Counties travel to be the predominant infrastructure user for a new cross-London railway of benefit for through HS trains (whether those trains were domestic or international in purpose).

This is clearly demonstrated *post hoc* in the case of Javelin services underpinning the infrastructure costs of HS1, with Southeastern in effect being subsidised by the UK Government to avoid what would otherwise be state-aid on the Continental main line. What the Javelin services might imply also for HS2 usage, is discussed below.

### **Where then for a London terminus? Shouldn't future demand rule the outcome?**

Isn't it simple: Euston? Since HS2 is really WCML tracks 5 and 6, why not use Euston – at least for HS2 Phase 1? This follows a maxim of least disruption to established travel patterns (a safe option) – but also of always doing what you always did, so always getting what you always got (so you might not get best future outcomes). Let's try starting somewhere else in the logic pattern as a sense check...

Future demand can be a yardstick, both in general and with specific rail corridors in mind. Wherever an HS2 railway ends in London might well influence the type of passenger demand. Shorter journey times via HS2 themselves require a review of the potential 'commuterisation' of HS2 journey sectors to and from London, certainly within a 30-90 minute time band – the same band as defined in Network Rail's Long Term Planning Process with its [London & South East Market Study](#) in 2013. There, the L&SE Market Study comments on pp.45-46:

"The data also suggests commuters are more sensitive to time and cost than business users, which makes intuitive sense as commuters travel more frequently... On this basis the following conclusions were drawn:

- large urban centres, and particularly central London, have the highest concentration of businesses and employment opportunities
- in the range of around one to two hours travel time, the impact of a small change in travel time on the level of business travel and hence economic output is relatively large

- in the range of around 30 to 90 minutes travel time, the impact of a small change in travel time on the level of commuting and hence economic output is relatively large
- improvements to rail services are therefore likely to result in the greatest increases in economic output where it is possible to provide a step change in journey times between large urban areas with a current journey time of two hours or more, to substantially less than that. This is particularly the case for journeys to and from central London.”

We should look not just at HS2, but also the reshaped WCML, where there is a visible overlap of future services between outer commuter and ‘intershire’, and ‘intershire’ with HS2. Indeed, a magnifying-glass focus on HS2 to the exclusion of the consequences and opportunities for WCML is definitely the wrong assessment yardstick.

### The HS and WCML commuter prospectus

From a transport perspective, while HS2 accelerates demand for intercity travel and capacity, the primary practical motivation for extra line capacity in the London area is directly linked to London’s commuter pressures. While Network Rail’s forecast intercity rail growth from 2013 to 2043 was low in the absence of HS2 changing the UK intercity marketplace (which it recognised was likely to occur, see L&SE Market Study p43), the WCML and other routes would nevertheless be unable to handle the foreseen commuter volumes, whether or not London 2050 planning put further pressure on commuting demand. We should also note that those NR’s forecasts are now out of date, even though they are only three years old.

The change, and indeed the rate of change, in forecast commuting growth on the West Coast corridor is quite remarkable over the past five years. In that time, we have had four studies: two general for the L&SE area, one HS strategic case, a new HS and WCML update. A fifth is under way. In sequence, the studies have been:

- Network Rail’s [London & South East Route Utilisation Strategy](#), published in July 2011. This relied on pre-2011 census data, and forecasted demand from 2011 to 2031.
- Network Rail’s London & South East Market Study linked above, published in October 2013. This used initial 2011 census data, but not the full data set which was then not available. It forecasted demand from 2013 to 2043.
- HS2 Strategic Case, published in October 2013.
- Department for Transport’s technical demand updates for HS2 and WCML, published in November 2015 <sup>(see footnote 2)</sup> as a supplement to the October 2013 strategic case.
- A WCML ‘Capacity Plus’ study which is underway, to see how to make the most of released WCML capacity, beyond current thinking.

Detailed analysis of the Network Rail studies has been set out in London Reconnections: [London 2050 Part 3 Tracks to the Future](#) and [London 2050 Part 4 Towards Maximum Rail Capacity](#). So we’ll just summarise those outputs below, which describe the projected gap in capacity vs forecast passenger volumes in the high peak hour inbound. The 2031 gap was stated before proposed interventions to be in place by 2031. The 2043 gap was stated assuming that those interventions would have been delivered, but they weren’t guaranteed to be in place. WCML, Midland and East Coast corridors are set out below, since those are the routes affected by HS2 services. The forecasts exclude any impact of HS2:

Overall projected gap in train capacity vs passenger volume, 2031 and 2043 AM high peak inbound (estimates made in 2011 and 2013, respectively)			
<b>West Coast:</b>	<b>2031:</b> 2,410 commuter, 635 intercity;	<b>2043:</b> 6,910 commuter,	1,235 intercity
<b>Midland:</b>	<b>2031:</b> 0 Thameslink, 1,335 intercity;	<b>2043:</b> 0 TL (44% standing),	3,335 intercity
<b>East Coast:</b>	<b>2031:</b> 2,955 TL + GN, 0 intercity;	<b>2043:</b> 6,800 TL + GN (50% standing),	1,135 intercity

The real capacity gap can now be expected to be larger, with London 2050 trends, recent rail demand trends, and the other impacts of jobs and housing. MML electrification offers some benefits here, but the combination of the Midland and GN incubus could require new tracks in one form or other. Alexandra Palace-Finsbury Park 3-tracking inbound was to be part of the 2031 solution, but doesn't help much for outer commuting pressures. The West Coast problem prior to any HS2-generated effects is precisely about greater use of the existing WCML railway and outer commuting demand. Some intercity/long distance travel in the figures above could also be considered as commuting.

The DfT November 2015 publications are instructive in that there has been extensive modelling of WCML demand with suggested alternatives to an HS2 railway. None of the alternatives is considered viable. There would be load factor limitations throughout the WCML, and no scope to expand beyond the 2030s capacity. In the London commuting area, the modelling outputs showed the following consequences in 2033/34:

Scenario	Number of services	Standard Class seats	Standard Class capacity
December 2014	28	15,132	20,234
All 12-carriage	28	19,344	25,884
Strategic Alternative	30	20,580	27,120
With HS2	41	30,330	41,103

Figure 43 WM AM Peak (07:00–09:59 arrivals into Euston) capacity scenarios<sup>51</sup>

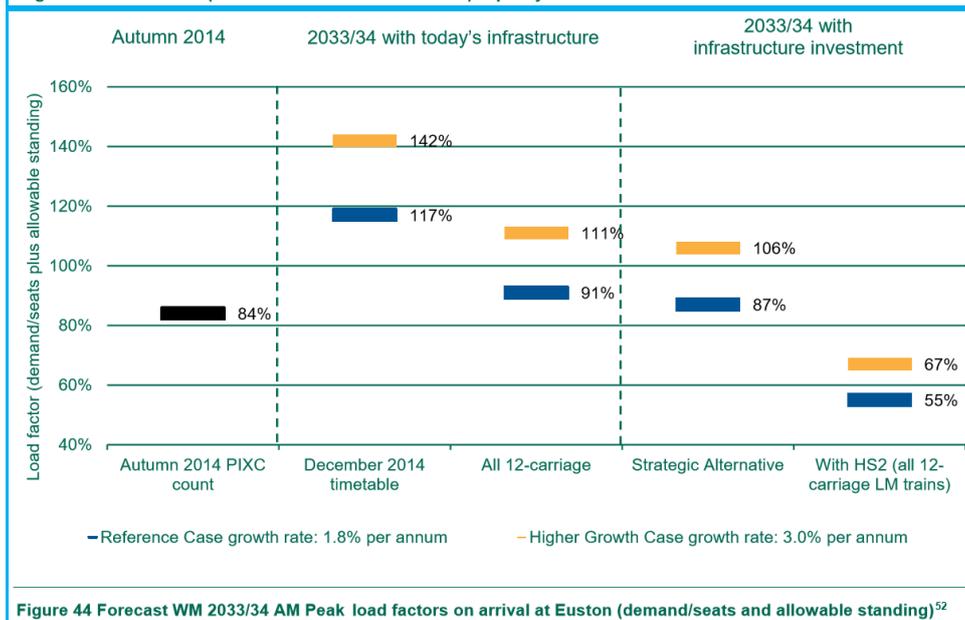
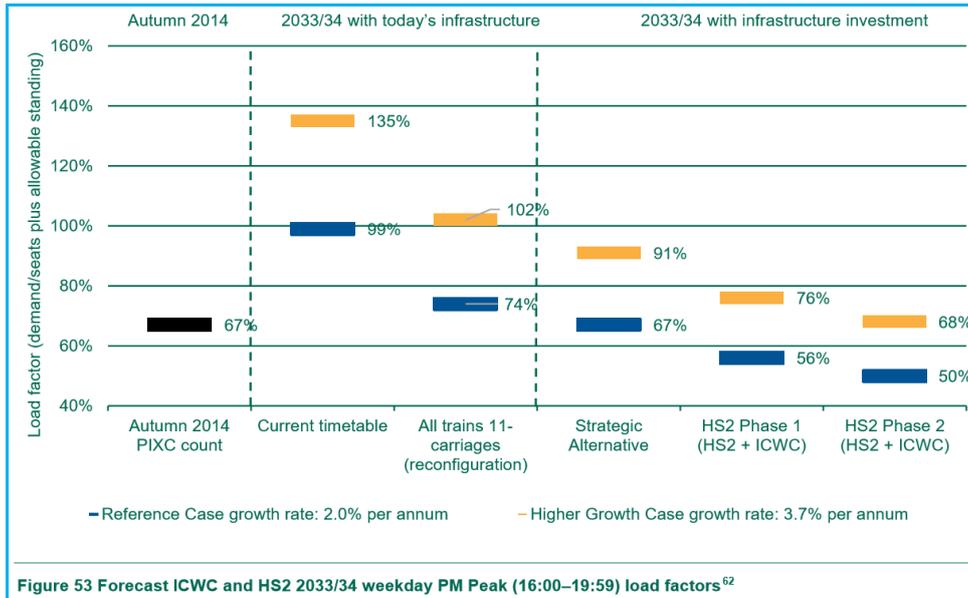
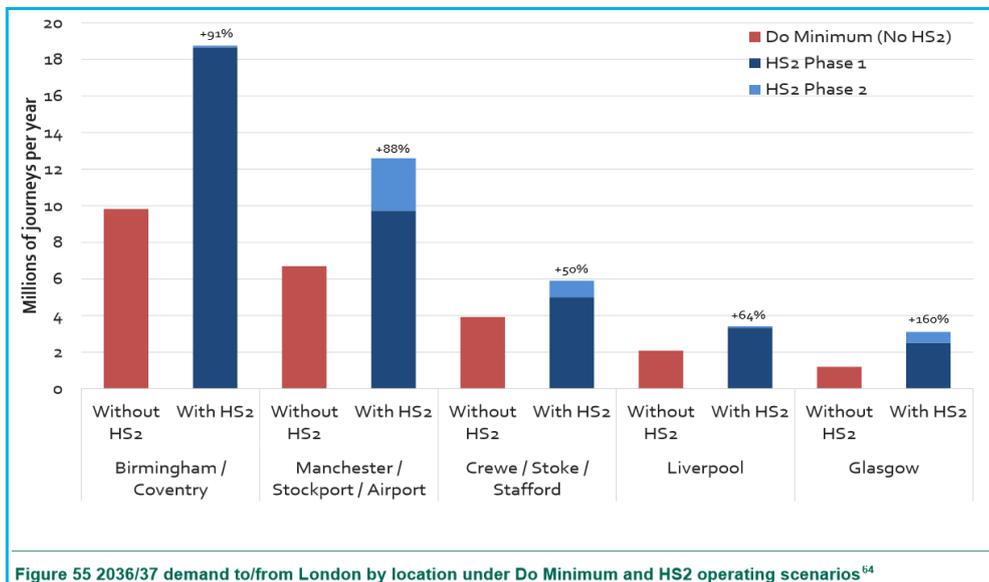


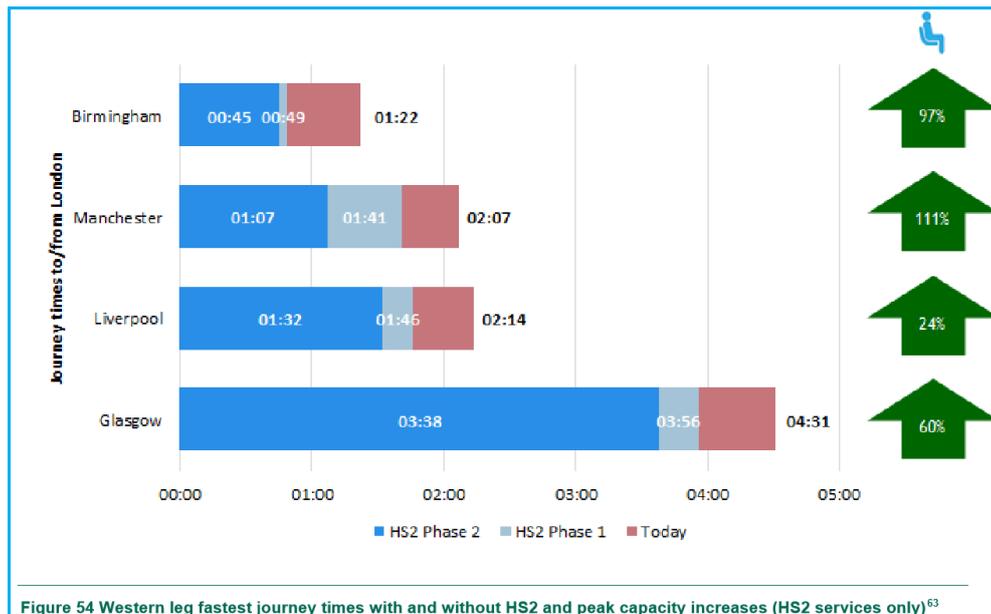
Figure 44 Forecast WM 2033/34 AM Peak load factors on arrival at Euston (demand/seats and allowable standing)<sup>52</sup>

Equivalent consequences were described for intercity services. Extensive standing was forecast on PM intercity services in the absence of HS2, up to 23% average on Fridays:



The conclusion was that a combination of HS2 and a revised WCML timetable was the best option to accommodate forecast long term demand, plus HS2 would generate additional demand – and implied economic growth – in its own right. The DfT studies pointed to high increases in absolute demand and proportional volumes, on the journey segments already foreseen by the 2013 L&SE Market Study as most susceptible to the influence of reduced travel times, the 30-90 minute sector.





### Back to the rationale for HS2's London terminus

In theory (we will consider further London commuting issues in Part B) the HS2 network becomes one primarily for inter-city-region travel, notably though with some poor network connectivity, which is the polar opposite of HS3's desired connectivity improvements. The separation extends to a significant distance at the busiest non-London city centre stations. There is a Brunellian 'change of gauge' explicit at Birmingham Curzon Street (750m to New Street, station centre to station centre) and Leeds New Lane (500m to City station). This makes London-Birmingham more akin to an 'intercity tube' service – a relevant consideration for commuting.

Out-of-city stations include Sheffield Meadowhall, and Toton halfway between Derby and Nottingham in the East Midlands. The impact on total travel time via the existing feeder/distributor rail commuter networks at Birmingham and Leeds is self-evident. Via Birmingham New Street to London, may still be quicker for some West Midlands-London travel. However Manchester HS is alongside Piccadilly interchange. The strongest HS stimuli are therefore Birmingham-solo, based on journey time, and Manchester city region based on journey time and connectivity.

The termini options are different in London. There are now no large vacant lands alongside relevant existing termini, land values are exceedingly high, and alternative ex-goods yard sites such as Nine Elms are already claimed. In the case of Eurostar, the initial option and the final option both ended up revisiting the utilisation of existing stations and adjoining lands, leading to a revamp of Waterloo and subsequently a revamp of St Pancras. Those reviews were **prior** to London's current economic and travel growth phase. HS2 has to address terminal capacity for its own trains **and** allow adequate capacity for foreseeable growth on existing main lines.

While in theory HS2 has a blank sheet of paper – you might hope to place a 'very large blob' in most locations under Central London – actually you can't and you wouldn't. Politics, logistics and environmental impacts would militate against that. HS2's approach alignment from the Chilterns basically pointed to:

- Old Oak Common (a West London Stratford-style option), where railway land did provide some opportunity though almost all is now designated for other railway operational or development priorities.

- Euston because it is a terminus where most of its intercity trains get diverted to HS2 platforms, so offers scope for a station revamp
- Paddington, as it is also relatively close to the OOC interchange.

In practice the onwards distribution links from OOC (primarily Crossrail 1/Elizabeth Line, and secondarily Overground) would be inadequate for a full HS2 service, though an HS2 station might get by for several early years on a 6-platform basis if it had to be a temporary terminus, because of construction complications at Euston. The OOC HS station was originally designed for 6 platforms, while HS2 Phase 1 requires only 6 platforms at Euston.

Approaching Paddington would require a separate HS2 tunnel from OOC which avoids the busy GW, Crossrail and depot tracks past Ladbroke Grove/Portobello. Space at Paddington for 11 terminal platforms abutting a Grade 1 structure would be immensely challenging for the existing built environment if not impossible, while the GW's final surface approach curvature is a 'no-no' especially with new 400m platforms. So any Paddington HS terminus would point to an underground terminus, at high cost without having solved onwards distribution within Central London. Paddington is also further in time from much of Central London, compared to Euston.

By contrast Euston is there, and is an under-used London terminus with low rates of platform re-occupation by trains, with less frequent 'turnover' than at King's Cross, St Pancras or Paddington. Another four main line platforms could be created within Euston's outdated internal 18-platform footprint, which was geared to mail, parcels and Motorail as well as passenger services. Crossrail 2 would in any case have to serve King's Cross and St Pancras to help relieve the Victoria Line, so routing CR2 via Euston is a significant but marginal variation to that overall project, yet achieves a fundamental change in Central London distribution capacity.

Part of the existing Euston should be capable of being handed over to HS2 with no loss of operational capacity for the WCML (Network Rail now says it needs 18 platforms before HS2 opens, 13 after). The present WCML timetable is designed, arguably wastefully, around Euston's platforms providing the recovery margin for long distance intercity services and a maintenance margin for the Pendolino fleet. It may be possible to identify other investment solutions for those gremlins, as well as for the existing 'throat' approaches which are now partly dependent on single-lead tracks which in turn inhibit platform re-occupation.

Diversion of WCML inner suburban stopping trains to Crossrail 1, at about 6 tph, would release additional platform capacity, although currently that is not part of HS2's scheme. WCML-Crossrail 1 had been allied with the HS2 scheme until 2014, but has been dropped to avoid HS2 project costs and foreseen high Network Rail costs. TfL might possibly pick up most of the tab if its budgets ever again permit that in future. Alternatively it becomes one of those failed schemes for future histories. Instead HS2 is making a £25m contribution towards part of the WCML-Crossrail link design, to be used as Crossrail reversing sidings on the remainder of the ex-NNML route west of OOC, along with passive provision there for an extension to the WCML.

To be pragmatic, Euston makes passenger sense for existing WCML users, both intercity and commuter passengers - back to the 'play safe' argument... Any future Crossrail 3 or Thameslink 2 might or might not come near Euston and then head towards the WCML, to 'tunnelise' future generations of commuter trains. However that would be in addition to Crossrail 2, so clearly CR3's time isn't yet, with a national funding fight still for CR2 before any other tunnel scheme could be allowed to raise its head. Therefore investment in a combined Euston, for both HS and WCML passengers, has made sense to the railway promoters, in terms of both 'realpolitik' and

‘railpolitik’. Euston is also near the other Northern railway termini, so not too much of a shock to MML and ECML users if and when their expresses were reorganised with HS2 Phase 2.

In an ideal world, that might have led to a design of an East-West HS2 station under Euston/St Pancras/King’s Cross – a different orthogonal geography to today’s Berlin Hauptbahnhof. Though HS2’s Chief Engineer Professor Andrew McNaughton thinks on bold lines, and considered this sort of arrangement, there were judged to be serious construction complications and risks, eg British Library and Francis Crick building vaults, while HS2 didn’t have that sort of funding. It has to work within the Treasury-approved budget. The ‘Euston Cross’ scheme as a concept includes such thinking on connectivity, but its time isn’t yet.

The problems with Euston? There are five main ones:

- Inaccessibility: distant from Southern main line termini, and hard to reach from East London, East Anglia and much of Kent.
- Capacity pressures at Euston tubes.
- Land take and community impact issues, for the extra HS track approaches and station tracks, and the new western land acquisition alongside the present railway.
- Reconstruction issues throughout Euston and the Camden approaches, and their surroundings, potentially over two decades.
- The fifth is an economic growth issue, that the economic stimulus of HS2 could be regarded as ending on the northern edge of Central London, at Euston, just as the WCML does. This is implicit in the first three problems as well, while the fourth could also see economic **downsides** locally if the Euston area were subjected to rebuilding impacts until the mid-2030s, 20 years away, which is currently is the expected outcome.

More on these matters in Part B.

### **Could High Speed 2 open up High Commuter 2?**

If Euston is to be the terminus of necessity if not the terminus of choice, what further lessons are there to consider for passenger demand (we’ll cover Euston design and construction topics in Part 2). The HS1 Javelins are an important comparator to review, as they are London’s first 21<sup>st</sup> Century HS commuter services.

Unlike Euston where HS2 intends to end up at the same terminus as the WCML, the HS1 domestic services operated by Southeastern were taken to Stratford and St Pancras, which are very different parts of town from the historic Southern termini. A 50-55 minutes time from St Pancras gets you in peak times to Folkestone and Canterbury (quicker from Stratford) and also with fewer HS miles to Maidstone and the eastern end of Medway at Rainham. Fares were also raised with a premium charge for HS use, while there was an additional SE-wide 5% increase above RPI for some years for most South Eastern fares.

After some years in the doldrums with these destination and pricing disincentives, demand is now high as people adjust journey patterns, the London economy has recovered from the recession, beyond-London housing has expanded, and new journey-to-work flows built up. The transformation of the Stratford and Kings Cross Lands areas as new destinations has been a large stimulus. At the Kent end, Kent County Council is pleased with the changes in East Kent residential and economic patterns which have resulted. A Thanet Parkway station will open around 2019, with a 70 minute timing to St Pancras. Extension of HS1 commuter services to Hastings and Bexhill, for area regeneration and faster commuting, is on the cards for the 2020s with 70-80 minute timings once Ashford West Jn is altered. Additional train sets are likely to be ordered.

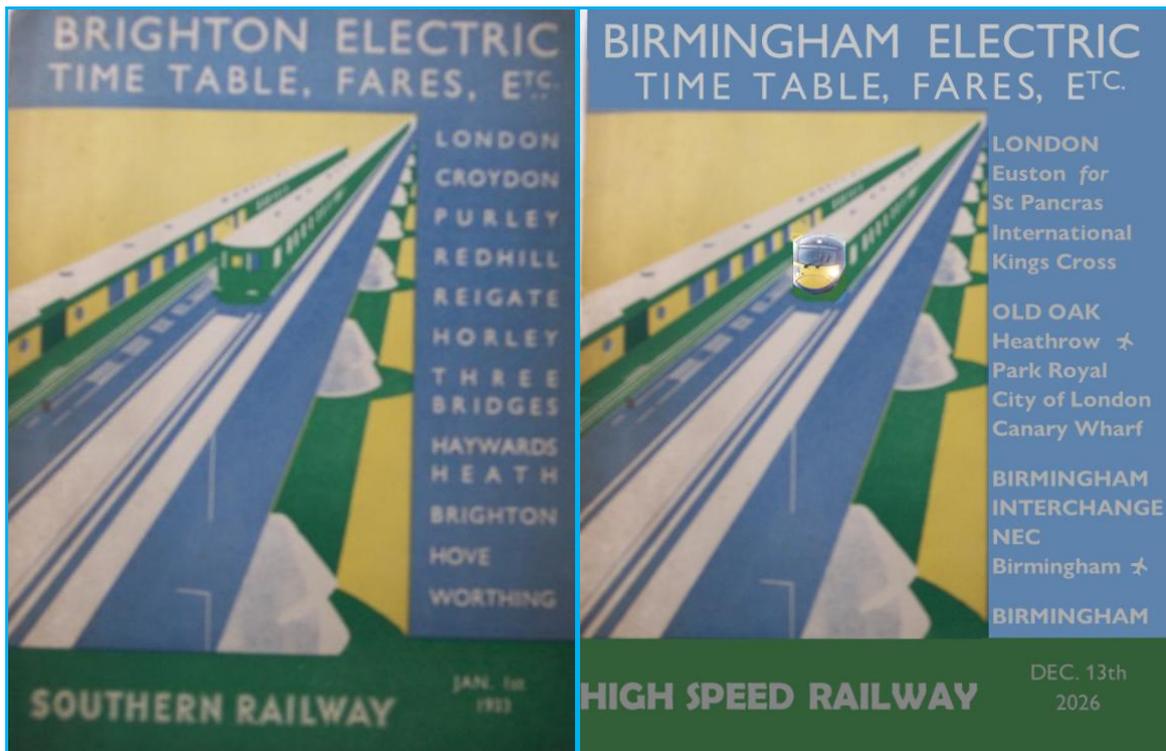
Now consider HS2. The London terminus is the same as for WCML classic services, so there is less disincentive to transfer to HS2. An approximate 50 minute time from the edge of Central Birmingham to the edge of Central London via HS2 (Curzon Street to Euston is 100 miles in a straight line), equates currently to a Euston-Rugby Pendolino or Euston-Northampton Desiro timing. These flows are busy with London commuters. 50 minutes will put Curzon Street in the isochrone for Twyford to Paddington (30 miles), and Haywards Heath to Victoria (34 miles).

So why shouldn't people choose to commute from Birmingham? Housing is very affordable compared to a London suburb, and quality of life is improving in its central city – the same inward-improvement forces as found in London's Hoxton, Fulham etc. A London scale of income would boost local spending when at home in the Midlands. 70 minutes is also a feasible commute from parts of the North West, based on the London and Home Counties experience. It will be the fare pricing that matters here.

A 30-35 minute time between Old Oak Common (expected to see 55,000 jobs) and Birmingham Interchange would be equivalent to typical tube journey times between Central London and Zone 6. It might be worth considering the impact of tube-type modelling on commuting demand for that journey sector. HS1's Stratford-Ashford and St Pancras-Medway timings are also about 30 minutes, so there are other comparators.

Even with current journey times of 1-2 hours between London termini and different parts of the West Midlands, there is a ready market that already provides room for three rail operators. If fares were scaled to market demand and line/train capacity, not just to distance – and whoever operates HS2 will have lots of capacity that it has to sell in order to be profitable – then why not a Birmingham journey-to-work at OOC or Central London? Boris Johnson as London Mayor has also looked forward to changing economic geography with London expansion, including 'the London Borough of Birmingham'!

Transport is a means to an end, but it can and will reshape the ends. Actually that's what Governments want at a macro-level from HS2 and HS3 – but can they control the real-world outputs? Planners originally saw the M25 as a London bypass, not as offering a new London & Home Counties travel-to-work lifestyle, but it rapidly took on that role, allied to its stimulus for large-scale land use changes in the Home Counties. Brighton as London-on-Sea with Southern Electric, Birmingham as London-on-Canals with HS2? Not impossible, just some lateral economics and modelling rules which trouble the DfT. **HS2 to b2e or not 'tu-be'?**



On that basis, it might be necessary nationally to contemplate ahead and start drafting an alternative plan for the Eastern/Yorkshire corridor to be served on a different route from a different London terminus, if HS2 Phase 1 started to become Birmingham Main Line 3 (BML3) with say 10-15 minute interval Birmingham services by the 2050s, following WCML and Chiltern. A corollary is for planning a later Crossrail or Thameslink that integrates the WCML corridor **across** London with a through main line, or a different style of London & Home Counties' Javelin HS1-HS2/WCML direct-running scheme.

This is all anticipating a more dynamic reaction to HS2 opening by prospective future passengers than planners are currently contemplating. However the changes already foreseen by DfT in November 2015 point towards a doubling of London-Birmingham demand by the mid-2030s, so our projected world might not require extra stimulus!

**END OF PART A**

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