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HS2 Capacity Analysis

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One of the key arguments put forward by the government in support of High Speed 2 ("HS2") is that it's the only effective way of increasing capacity on the rail network. Philip Hammond pushes this argument strongly in the main consultation paper *High Speed Rail: Investing in Britain's Future*.¹ He writes in the Foreword that:

"...today's railways face a huge capacity challenge. Rail passengers are familiar with overcrowding, used to long queues and are almost certain to have found themselves standing on a long distance journey at some point. And demand is set to rise sharply in the years to come. On the West Coast Main Line in particular, new rail infrastructure will be essential. By providing a huge increase in capacity for long distance passengers between our major cities, high speed rail would ensure we are ready for those challenges"

But detailed analysis of the documents published to support the case for the new line shows that **for key flows HS2 provides less capacity than now**. And there are better alternatives which will provide extra capacity more quickly and at less cost, and can be delivered incrementally as needed.

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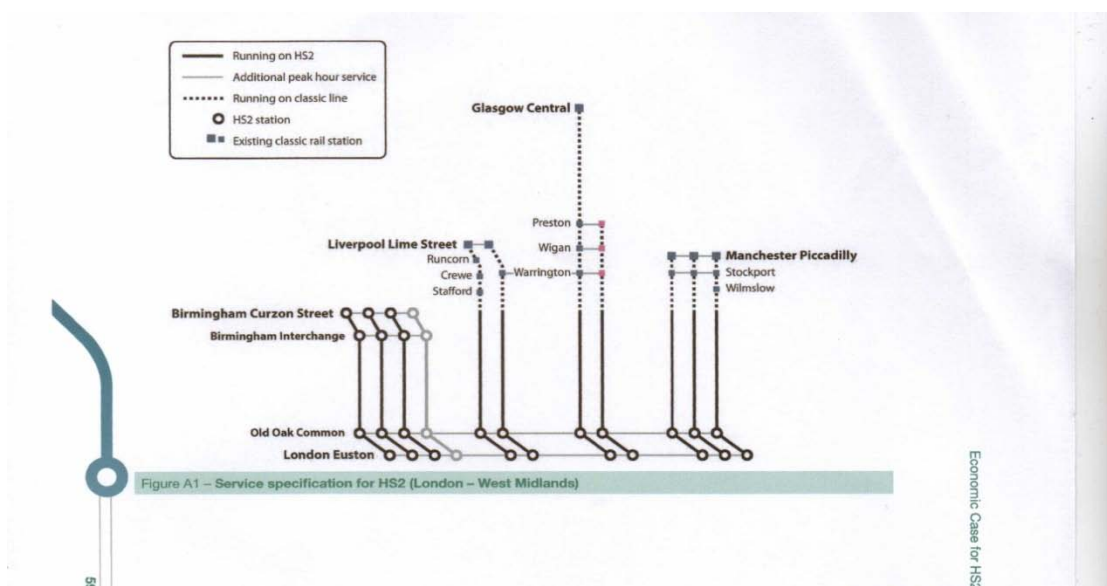
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¹ <http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hsr-consultation.pdf>, pg. 5

Phase 1 (2026)

The biggest passenger flow on the West Coast Main Line is between London and Manchester. There are three trains an hour today. The Government has already committed to lengthen these from 9 to 11 cars from around 2012, and each train will then have 589 seats, giving 1,767 seats per hour.

When HS2 Phase 1 is scheduled to be complete in 2026, the published plans still only show three trains per hour, as set in the supporting document *The Economic case for HS2*,² and shown below:



This shows three trains an hour to Manchester. They run on HS2 as far as its junction with the existing route north of Lichfield, then on the existing network between Lichfield and Manchester. HS2 Ltd's documentation states that the trains will be in units which each have 550 seats.³ On services which operate throughout on the new route (only London – Birmingham in Phase 1), these can be operated in pairs, giving 1,100 seats per train. But services which operate partly over existing routes will be formed of one unit only, as two unit trains would be much too long for all the stations, and could only be accommodated with extensive expenditure and disruption.

So for Phase 1, from 2026 until at least 2032-33 (assuming Phase 2 is built), HS2 plan to provide 3 x 550 seats to Manchester, a total of 1,650 seats, and **a reduction of 6.6 per cent on the total from 2012**. At the same time, HS2 forecast passenger growth of 216

² <http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hs2-economic-case.pdf>, pg. 59

³ <http://webarchive.nationalarchives.gov.uk/20110131042819/http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/hs2ltd/technicalappendix/pdf/report.pdf> HS2 Technical Appendix December 2009, Appendix 2: Day 1 Train Service assumptions for demand Modelling para 3.2

per cent for Phase 1 (more than three times the current total), and claim reduced overcrowding. This is not credible.

The Department of Transport (DfT) may seek to argue that the service assumptions are only illustrative, and more trains could be operated to Manchester. In addition to the three trains routed via HS2, the documentation published in March 2010 indicated that there would be one train remaining on the existing route to serve intermediate flows such as Milton Keynes to Manchester and Stoke-on-Trent to London. So there would be four London trains an hour to Manchester, but one will be much slower and is assumed only to carry intermediate traffic.

But this part of the network is already heavily congested, and in its evaluation of alternatives for upgrading the existing network, DfT argue that it would be necessary to spend £1.6 billion on work to increase capacity north of Lichfield⁴ and enable operation of four trains an hour to Manchester, although HS2 are implicitly claiming this isn't needed for *their* four trains an hour, as no costs for this work are included in their estimates. It is simply not credible for DfT to claim that the HS2 service to Manchester could be increased to the six or more trains an hour which would be needed to carry their forecast passenger numbers without major expenditure on the existing network.

⁴ <http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hsr-strategic-alternative.pdf> Page 41, WCML scenario B items B1 and B4

Phase 2 (2032-33)

While completion of Phase 2 would enable operation of two unit trains to Manchester, the Phase 2 plans are also fundamentally flawed. The "Service specification assumptions for the Y network" are set out in *The Economic case for HS2*⁵ and shown as an appendix to this note.

That document shows a total of 18 trains an hour, which is recognised internationally as the absolute maximum capacity for a high speed line. As with Phase 1, there are major flaws in the service pattern shown:

- The main consultation document shows journey times from London to Edinburgh reduced to 3 hours 30 minutes (on page 20), but the service pattern shows no services to Edinburgh.
- The pattern only shows two trains an hour to York, Darlington and Newcastle. But there are two trains an hour today, and these are typically the busiest services on the East Coast Main line. When the new IEP trains just announced by Philip Hammond are introduced, seating capacity per train will be 649 seats, giving 1,298 seats per hour, yet in 2033 DfT propose to have only 2 x 550 seat trains per hour, giving 1,100 seats, which is a **reduction of 15 per cent**, despite forecast growth of over 200 per cent.
- The actual number of London services overall will also ultimately be significantly less than set out in the service specification, as this doesn't take into account the proposed links to HS1 and Heathrow. This is clear from the note on the bottom of page 61:

"Further work is being done to determine which of the above services might serve Heathrow.....and which might run on to mainland Europe".

Services to HS1 and Heathrow cannot, of course, serve Euston as well.

⁵ <http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hs2-economic-case.pdf>, pg. 61

Alternatives to HS2

DfT themselves commissioned work on alternatives involving upgrades to the existing West Coast Main Line. This work was published as the *High Speed 2 Strategic Alternatives Study – Rail Interventions Report* in March 2010 at the same time as the original HS2 report.⁶

“Rail Package 2” (“RP2”), described in the report, sets out a series of incremental enhancements which potentially provide an 135 per cent increase in capacity, a considerably larger increase than the background growth forecast for HS2, and with less crowding - the overall load factor (per cent of seats occupied) is 51 per cent for RP2 compared with a forecast of 58 per cent for HS2 (an average which doesn’t take into account the totally inadequate Manchester capacity described above). The capital expenditure is much lower than for HS2, and the cost-benefit ratio is significantly higher.

Even Rail Package 2 is not optimised. For example, it doesn’t properly evaluate increasing the length of trains on the route from 11 to 12 vehicles, which is possible with only small scale expenditure to all destinations except for Liverpool, and it doesn’t consider changing the balance between standard and first class capacity, which, following corporate and public sector cut backs, is now grossly over-provided.

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<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/alternativestudy/pdf/railintervention.pdf>

Delays to increased capacity

DfT's consultation documents make clear that the case for HS2 is based on an assumption that no further investment is made to enhance capacity on any of the routes ultimately affected beyond schemes which are already committed.

This approach condemns existing passengers to progressively increasing overcrowding on specific parts of the network where this is already a problem. A prime example is the commuter service between Northampton, Milton Keynes and Euston, where there is high growth and already significant overcrowding – in the evening peak period, it is necessary to join fast services up to fifteen minutes before departure to be certain of getting a seat, with passengers standing for a minimum of thirty minutes, often longer. Yet there is potential to implement improvements on an incremental basis, for example by construction of a grade separated junction south of Milton Keynes which, together with higher performance new rolling stock, would allow commuter capacity to Milton Keynes and Northampton to be doubled.

Action is urgently needed on these flows, and improvements could be delivered in about five year's time (2016). Furthermore, DfT's own documentation (RP2) demonstrates that this approach is realistic and deliverable. But with HS2, there will be no capacity increase until 2026.

The position on the Midland and East Coast Main Line Routes is much worse: no capacity increase until 2032-33 at best.

Disruption to existing services during construction

Euston

There will be major disruption at Euston over a 7 to 8 year period, as it is proposed to rebuild the station completely. Construction of the HS2 approach tracks to Euston is also likely to cause disruption to the route into the terminal during this period.

It is likely that train services into Euston will have to be reduced for considerable periods during this work, both as a result of reductions in the number of platforms available during construction and a reduced number of approach tracks, reducing the capacity of the route. This is likely to affect both Inter-City and commuter services.

In addition to the direct impact on train services, passenger circulation will be seriously affected during the construction programme: Euston will become a building site for seven years.

The potential disruption is obliquely acknowledged in the consultation documents:

"...the major redevelopment project necessary at Euston station, lasting between seven and eight years..."⁷

And also in the consultation document for the next West Coast franchise:

"...it is likely that major construction work will be needed at Euston station to enable the new high speed rail lines to be incorporated into the revamped station building. The phasing of any such works will only be decided after the consultation, but the new franchisee would need to be prepared for the possibility of some disruption to both services and the station concourse interchange during the next franchise"⁸

Great Western Main Line

The major and complex work required to build Old Oak Common station may require reductions to commuter and InterCity services to and from Paddington for a significant period, in addition to the impact of the committed Crossrail project.

⁷ High Speed Rail: Investing in Britain's Future February 2011. page 54, para. 2.68

⁸ InterCity West Coast Consultation Document January 2011. Page 39



Chiltern Line

Construction of HS2 parallel to the existing Chiltern line route between Northolt and West Ruislip may require significant disruption to Chiltern Line services.

Other locations

There will be limited disruption at other locations, for example for the construction of the junction at Lichfield at the North end of the Phase 1 route, and at locations where the route of HS2 crosses sections of the existing network.

Cities and towns with worse rail services as a result of HS2

While some places will, eventually, get a faster service many towns will lose out. In many cases this has already been exposed but is included here for completeness. Here are some selected impacts:

Table 1: The Impact of HS2 Phase 1

Station	Impact
Milton Keynes, Northampton	Potential doubling of commuter capacity from around 2016 not taken forward in advance of HS2
Coventry	Frequency reduced from 3 to 1 train per hour from 2026, with journey times extended by 10 minutes, as trains stop at Rugby, Milton Keynes and Watford Junction
West Midlands suburban network via Birmingham New Street	Implications for connections with the West Midlands suburban network - Frequency reduced from 3 to 1 train per hour from 2026, with journey times extended by 10 minutes, as trains stop at Rugby, Milton Keynes and Watford Junction.
Sandwell, Dudley and Wolverhampton	Journey times extended by 10 minutes
Shrewsbury, Wrexham and mid Wales	Journey time for connecting services from Wolverhampton and Birmingham New street increased by 10 minutes, and Frequency from Birmingham New Street reduced from 3 to 1 trains an hour.
Stoke-on Trent	No high speed service proposed. Frequency reduced from 2 to 1 train per hour. Average journey time lengthened slightly
Manchester, Stockport	A reduction in overall capacity on the route, from 1,767 seats to 1,650 seats per hour, despite Network Rail's forecasts that this route would have the highest growth. ⁹

⁹ This assumes 550 seats for HS2 units, as set out in the consultation documentation, and 589 seats for 11 car Pendolino sets.

Table 2: The Impact of HS2 Phase 2

Station	Impact
Wellingborough, Kettering, Corby, Market Harborough	Electrification, journey time reductions and increased capacity not taken forward in advance of HS2 (2032-33 at the earliest)
Leicester	Electrification, journey time reductions and increased capacity not taken forward in advance of HS2 (2032-33 at the earliest) Service frequency and journey times likely to deteriorate on completion of Phase 2 – Leicester currently has four trains an hour, two non-stop
Loughborough	Electrification, journey time reductions and increased capacity not taken forward in advance of HS2 Service frequency and journey times likely to deteriorate on completion of Phase 2 – Loughborough currently has two trains an hour, one non-stop from Leicester
Nottingham, Derby, Sheffield	Electrification, journey time reductions and increased capacity not taken forward in advance of HS2 Reduced frequency and increased journey times for existing city centre stations Loss of local transport interchange
Chesterfield	Electrification, journey time reductions and increased capacity not taken forward in advance of HS2 Service frequency and journey times likely to deteriorate on completion of Phase 2 – Chesterfield currently has two trains an hour, non-stop between Leicester and London
Peterborough	Service frequency likely to deteriorate on completion of Phase 2 – Peterborough typically has three/four fast trains an hour.
Doncaster, Wakefield	Service frequency and journey times likely to deteriorate on completion of Phase 2
York, Durham, Darlington and Newcastle	HS2 documentation shows two High Speed trains an hour - no capacity increase on the present service
Berwick on Tweed	HS2 documentation shows no High Speed trains North of Newcastle
Edinburgh	HS2 documentation shows no High Speed trains to Edinburgh via Carlisle or Newcastle

Appendix: Service specification for HS2

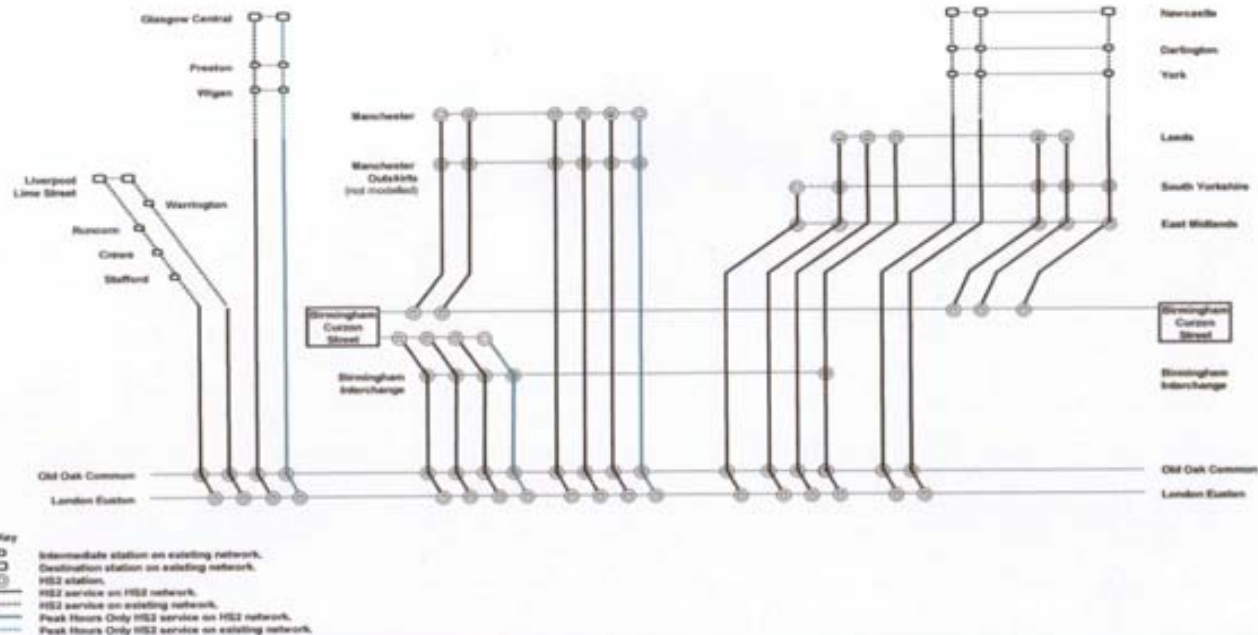


Figure A2 – Service specification assumptions for the Y network
 N.B. Further work is being done to determine which of the above services might serve Heathrow and which might serve Heathrow, and which might run on to mainland Europe.