

high-speed north - building a trans- pennine mega-city

Peter Hall, David Thrower and Ian Wray set out a 20-year staged programme to create high-speed rail links between the major cities of the 'South of the North'



Network Rail

Left

Computer-generated image of Manchester's Victoria station, being recreated by Network Rail – but it awaits 21st century trains

Two weeks after assuming chairmanship of HS2, in March 2014, Sir David Higgins said in Manchester: *'What my personal experience reflects is the two main transport challenges we face as a country: the lack of capacity, particularly but not exclusively south of Birmingham; and the poor connectivity in the North, not just between the region and London, but also east-west between Liverpool and Manchester, Manchester and Leeds, Leeds and Hull. Those challenges have direct consequences, not just for the economy as a whole, but for people's daily experience and aspirations.'*

Introducing his new report, *HS2 Plus*,¹ Sir David pinpointed the key problem and threw down a challenge to planners and decision-makers across northern England:

'For some areas in the north... the bigger problem is connectivity – journey times are too slow. The

key to improving these, particularly east to west, is to integrate HS2 into the existing network to improve connectivity between Liverpool and Manchester, Manchester and Leeds, Leeds and Hull... HS2 and the future of the existing network need to be considered together to maximize the synergy between them.'

We agree. HS2 is vital for the cities of the North – but alone, as Sir David emphasises, it is not enough. In this article we respond to his challenge and set out a programme that provides a solution to his dilemma.

Unifying the North

The fact is that the UK now has the biggest regional disparities in Europe. Just in terms of population, Greater London (at 9.8 million) is as big as the next six urban areas put together. If Britain were a typical country, you might expect it to have a

second city of about 5 million people, which is twice the size of Greater Manchester or the area around Birmingham.²

Ed Miliband, speaking in Birmingham on 8 April this year, powerfully conveyed this message when he said: ‘The country that once built its prosperity on the great towns and cities, like Birmingham, Bristol, Liverpool, Leeds, Manchester, Glasgow and Cardiff, has become a country which doesn’t do enough to build prosperity in England outside one great capital city: London.’

If our national economy is to be rebalanced, we must create an economic counterweight to London which can offer the conditions for growth and the vital agglomeration economies currently found only in the metropolis:

- a large and diverse population and economic base;
- the ability to attract and retain talent, especially in young and dual-income households;
- a critical mass of top professional and super-creative people;
- sufficient nationally and internationally significant universities and research institutions;
- first-class regional, national and international transport connections, including airport connections; and
- quality, range and depth in the arts and culture.

To achieve this, there are two options: to build up the facilities in each and every one of the UK’s other cities to London’s status – effectively, ‘Mission Impossible’ – or to bring together the economies of some of our biggest and closest cities through better and much faster transport links, creating a mega-city rivalling London in scale and economies of agglomeration.³ This can be achieved in the ‘South of the North’, bringing together three great core cities which by an accident of geography are only 60 miles or so apart – Liverpool, Manchester and Leeds – by investing in a new high-speed rail link, in the same way as London is already linked to Paris and Brussels, and Manchester and Leeds will be linked to London by HS2.

Together with electrification of other key links to places now isolated from the core cities’ labour markets,⁴ this link can dramatically enlarge and enhance access to good jobs in growing sectors in those cities, ‘irrigating the region’, as the French put it. It has been achieved around Lille, a comparable city in a similar old industrial area in Northern France;⁵ it can be achieved here in the UK too.

What we have today: a living antique

The railways which today link Liverpool, Manchester and Leeds are very old indeed, built by labourers with wheelbarrows, picks and shovels. The Liverpool and Manchester Railway was the first passenger-carrying inter-city railway in the world,

designed and engineered by George Stephenson. It is a Georgian railway, opened in 1830, before Queen Victoria took the throne, and is still used daily. Stephenson also engineered the first trans-Pennine route from Manchester to Leeds via Halifax. He sought out gentle gradients and chose a relatively circuitous route, avoiding as much as possible the need to tunnel, and providing the easiest route for the under-powered engines of his day. It is in daily use today.



Source: Wikimedia Commons

Above

Sankey Viaduct, on the world’s first inter-city railway, still in use today – the North’s rail network is a living antique

The route from Manchester to Leeds via Huddersfield came a little later. It opened in 1849, running from Stalybridge to Heaton junction (operated by the Leeds and Manchester Railway); a new junction from Bradley to Bradley Wood junction was completed in 1850, while the Standedge Tunnel on the line near Diggle was at the time the longest in England, at 3 miles, 66 yards. Despite this long tunnel, high on the moors, it is a twisting and steeply graded route. It, too, is in daily use today.

Not only are these railways old, but they were largely built to transport goods and coal, rather than to provide swift passenger connections.

Worse still, they are not even what they once were. There has been scarcely any investment since the end of the Second World War, and actually significant disinvestment. Signalling systems are often out of date (thus the distances between trains must be long and capacity is reduced), and many junctions permit only very slow running. Much of the Manchester-Huddersfield-Leeds route was ‘four-tracked’ in the past, giving faster trains the opportunity to pass local stopping services. So were parts of the Liverpool-Manchester route. The extra rails were all lifted as the system contracted in the late 1960s and early 1970s, when rail was in the depths of decline.

Major subsequent investment schemes in the system can be counted on the fingers of one hand. Liverpool got the Loop and Link connecting tunnels, integrating its suburban railways beneath the city centre; but Manchester failed to get its new tunnel between Piccadilly and Victoria. The east-west rail link in Central Manchester (connecting Liverpool and Manchester Oxford Road, Piccadilly and Manchester Airport) has only two tracks and is extraordinarily congested.

Many smaller stations have poor facilities. Eccles station, important in serving Salford's MediaCity, is not served by the Eccles-MediaCity Metrolink line. Diesel trains (some of which are themselves obsolescent) struggle with steep gradients over the Pennines. Journey times are very slow by modern UK and European standards.

'The objective, by the time HS2 Phase 2 opens in 2030, is to create *High Speed North (HSN)*: a true high-speed line linking the core northern cities and neighbouring towns, and directly feeding into the two northern arms of the Y-shaped High Speed 2, in Manchester and West Yorkshire'

Only in very recent years has the promise of new investment at last arrived. The Liverpool-Manchester and Manchester-Leeds lines are finally being electrified, and in Central Manchester the Northern Hub project will at last construct a few hundred yards of new track to provide a new through route between Victoria and Piccadilly stations.

The objectives

The Higgins challenge has been backed by Chancellor George Osborne's budget, with its £1 billion infrastructure boost. There will be huge enthusiasm in the North for the idea of additional investment in the pre-election run-up, to achieve two key objectives:

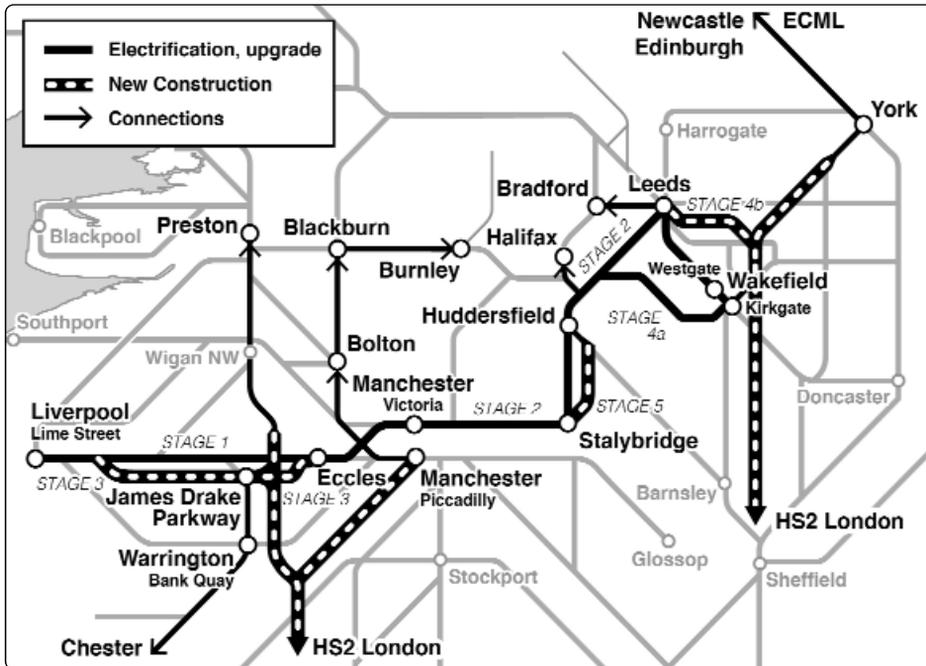
- To link HS2 – including an express link from Manchester Airport – to major northern cities and towns not now served: Liverpool, Bolton, Blackburn, Burnley, Huddersfield and Bradford.
- To provide a higher-speed, higher-capacity service between the core cities of Liverpool, Manchester, Leeds and York.

This route must follow the Liverpool-Manchester-Huddersfield-Leeds corridor, continuing to York in order to connect to the East Coast Main Line for onward service to Darlington, Durham and Newcastle. It is a strategic rail connection linking three of the biggest cities in England, 60 miles apart, with about 6-7 million people (closer to 10 million with feeders), an international port and airport, six research universities, and a huge stake in the UK's manufacturing, service and logistics sectors.⁶ Without adequate 21st-century infrastructure, these northern cities will have little chance of competing not just with London, but with cities around the world in the global economic race. To be sure: Leeds, Liverpool and Manchester need much more than just new transport investment. But fast rail connections can play a huge role in underpinning their growth as an integrated high-level labour market and in building up urban agglomeration economies.

As Sir David Higgins noted, the fastest current journey time between Liverpool and Manchester (separated by 32 miles) is 47 minutes, and between Manchester and Leeds 53 minutes. Passenger traffic between Manchester and Leeds is of a much lower volume than would be expected given the size of these two cities, less than 40 miles apart.

The ultimate objective for this line must be to achieve the same speeds as on the best parts of the national inter-city system, running at steady speeds of up to 125-140 mph. Trains currently cover the 77-mile London Paddington-Swindon journey in 55 minutes, with an intermediate stop at Reading, at an average speed of 84 mph; and in 2018-19 electrification and new signalling⁷ will cut journey times by a further 10 minutes, to about 45 minutes, and increase average speed to around 102 mph. On the more tightly engineered West Coast Main Line, the introduction of Pendolino tilting trains plus infrastructure improvements reduced times on the 82-mile London Euston-Rugby section to 48 minutes – an average speed of 102 mph.

In contrast, after electrification in December 2014,⁸ the 75-mile Liverpool-Leeds journey will be cut from 107 to 82 minutes – a saving of 25 minutes, but still achieving only an average speed of 55 mph, perhaps rising to around 60 mph as electrification extends eastwards after 2016. This equates to speeds on Brunel's Great Western *in the 1870s* – not to a 21st-century schedule on a 175-year-old railway, let alone on a European-standard new-built line. *The ultimate objective of HS North should therefore be to cut the overall Liverpool-Leeds journey time to at most 55 minutes.* This will require major investment, since the 19th-century infrastructure, designed for dense freight traffic and slow passenger transit, is so much poorer than on the great trunk lines engineered by Brunel or Stephenson.



Left
Fig. 1 Proposed High-Speed North programme map, 2014-29

In what follows, we demonstrate how this could be achieved in a staged 20-year programme. The first priority, in parallel with the current electrification, is to introduce Pendolino tilting trains on the West Coast Main Line model. A second is to build new links and upgrade existing infrastructure improvements to achieve significant increases in speed and capacity – in the first 20 miles from Liverpool, the middle 20 miles through Manchester, and the last 20 miles into Leeds. A final and more ambitious priority will be greatly to increase speeds on the most difficult trans-Pennine section between Manchester and Huddersfield.

Our proposal, below, seeks to achieve both objectives by common investments at the west end of the line ('the first 20 miles') and the east end ('the last 20 miles') and other investments around Manchester ('the middle 20 miles') to provide additional capacity and significantly higher speeds on the main spine route and better access from HS2 stations to non-HS2 regional centres. The objective, by the time HS2 Phase 2 opens in 2030, is to create *High Speed North (HSN)*: a true high-speed line linking the core northern cities and neighbouring towns, and directly feeding into the two northern arms of the Y-shaped High Speed 2, in Manchester and West Yorkshire.

A staged programme for change

We set out here a *five-stage programme* (see Fig. 1) to achieve a new west-east high-speed line across the 'South of the North':

- **HSN stage 1:** To be achieved in December 2014, with electrification of the first stage between Liverpool and Manchester.

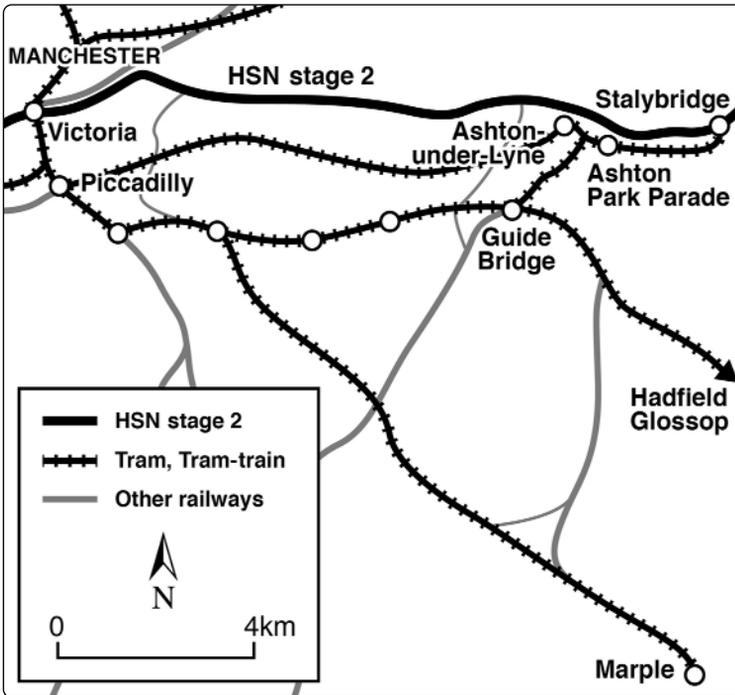
- **HSN stage 2:** The modest investments under way through the Northern Hub project, plus the committed electrification of the steep and winding Standedge route from Manchester to Leeds, coupled with (uncommitted) introduction of Pendolino trains to exploit the maximum capacity of the upgraded infrastructure.
- **HSN stage 3:** The first major new investment – a high-speed diversion for the first 20 miles out of Liverpool, onto new tracks.
- **HSN stage 4:** A parallel investment for the last 20 miles into Leeds.
- **HSN Stage 5:** A new direct base tunnel under the Standedge summit, completing a brand-new 60 mile high-speed railway.

We spell out the components of these projects in detail below. It needs to be emphasised that, beyond the current commitments to the Northern Hub project, no-one is currently thinking or planning on this scale.

The first 20 miles

The two routes from Liverpool to Manchester are George Stephenson's direct line across Chat Moss and, to the south, the former Cheshire Lines railway via Warrington. Warrington is very important, but the potential of the Chat Moss line, straight and level, makes it immediately preferable as a high-speed route – and it can also serve North Warrington. The long-term vision involves four-tracking much of this line, with new high-speed stretches for inter-city services bypassing slower local trains.

The starting point must be Lime Street, where capacity is severely restricted both in number of



Left

Fig. 2 Proposed South-East Manchester Metrolink tram-train network

platforms and platform length. There may be some scope to open out the throat, extending the present platforms, and remove the present cab road, but any major improvement could be hugely expensive.

An intriguing alternative possibility is to re-open the long-redundant Victoria Tunnel under the coach station about 400 metres north of the rail station, putting local Merseyrail City Line services into this tunnel and leaving the terminus for longer-distance high-speed services. Merseytravel (the integrated transport authority for Merseyside) might seriously consider this because it has maintained the Victoria Tunnel as a long-term possibility for a new connection to North Liverpool. This route might be capable of being linked to the Wirral Line 'loop' under Lime Street station, which is apparently only 200 metres distant under the south-west corner of Lime Street and William Brown Street.

From Edge Hill to Newton-le-Willows, the line is seriously congested because of City Line local stopping trains, and four-tracking could be difficult and expensive in places. Network Rail will install a fourth track between Huyton and Roby by 2017.⁹ However, it also appears possible to four-track the line from Edge Hill through Wavertree Technology Park to Broad Green without too much difficulty.

From here, the clear solution is a new 15-mile high-speed line (HSN stage 3, the first major new-line component of HSN), breaking out at the western end of the M62 and following the north side of the motorway before swinging away north-eastwards to rejoin the Chat Moss line immediately east of the West Coast Main Line at Parkside

junction. This would also contain a bi-directional delta junction, north and south to the future HS2 just south of its division from the West Coast Main Line at Bamfurlong junction. It will thus simultaneously serve two key purposes:

- It will ease severe capacity constraints, and further cut journey times, on this congested stretch of the line.
- On completion of HS2 Phase 2 in 2030, it will serve as a direct high-speed link to Liverpool from HS2. However, it should be completed well ahead of HS2: during Network Rail's Control Period 6, 2019-24.

Immediately west of the new Parkside junction system, a new park-and-ride station, James Drake Parkway, would be built on the site of the old Parkside Colliery,¹⁰ with a new 800 metre road link to junction 22 of the M6.

The middle 20 miles

Thence, having picked up services from Chester and Warrington Bank Quay that have joined the Chat Moss line at Earlestown East junction, and after a fast transit across the Moss, in Manchester all trains would stop at an interchange at Eccles, involving a short extension of the Metrolink line up Church Street, to provide an easy interchange to the fast growing MediaCentre at Salford Quays, plus bus and park-and-ride local links to serve the remainder of Salford.

Thence, crossing the Piccadilly-Bolton line,¹¹ trains would run into Victoria station, currently being

remodelled for extra capacity, which provides a more direct and faster link eastwards than the alternative from Piccadilly via Guide Bridge. The Northern Hub, now at last starting construction, will provide a new direct link – the Ordsall Curve – between Piccadilly and Victoria stations, allowing suburban rail connections from the south to link into Victoria and beyond, thus generating a new range of services on HSN eastward from Victoria. It will also simplify critical connections from HS2 (including an express service from Manchester Airport) to Bolton – and, when electrification is finally approved, on to Blackburn and Burnley.¹²

To meet these additional demands and cut journey times, the Victoria-Stalybridge route (see Fig. 2) should be exclusively reserved for HSN trains, with stopping services from Piccadilly on the parallel, relatively slow line from Piccadilly to Stalybridge via Guide Bridge (with four intermediate stations, currently part of the Network Rail electrification programme). A critically important consideration here is that Transport for Greater Manchester (the body responsible for co-ordinating public transport services throughout Greater Manchester) is actively considering conversion of



Above

Gotthard Base Tunnel, on course for opening in 2016 – a model for the trans-Pennine section of High-Speed North

the Piccadilly-Marple line to tram-train operation. It seems logical also to include:

- conversion to tram-train of the already electrified Hadfield/Glossop line and the Guide Bridge/Stalybridge line;
- linking the existing Manchester Metrolink Ashton-under-Lyne route (opened in October 2013) via a short town centre extension down Warrington Street across Park Parade to a new Ashton station (Ashton Park Parade) on the Guide Bridge line; and
- extending onward to Stalybridge, where the

recently remodelled station should offer adequate tram terminal capacity with interchange to HSN.

These local improvements should be completed together with the Manchester-Leeds electrification, during the later years of Network Rail's current Control Period 5, 2014-19.¹³ The result would be an extended Metrolink system interchanging at its outer ends (Eccles and Stalybridge) to HSN, on a model successfully used in German cities.

From Stalybridge eastwards, the initial objective is to provide additional capacity and increase speeds up across the Pennine summit and down into Huddersfield. On the existing trans-Pennine line the curves and gradients are severe, although Pendolinos cope perfectly well with similar gradients at the Shap and Beattock summits. From the three-mile Standedge Tunnel eastwards to Huddersfield there is a four-track formation with only two tracks, that have been slewed to increase speeds. This could be restored to 1960 alignments again, but – even with Pendolino operation – it could never even remotely constitute a high-speed line.

The options here are thus:

- **A low-cost early-stage improvement (HSN stage 2), whereby one or more future trans-Pennine franchise bidders offer Pendolino service, as Virgin did for the West Coast Main Line:** Even this would require complementary route improvement work by Network Rail. A key consideration would be how to secure sufficient route/timetable capacity for inter-city Liverpool-Eccles-Victoria-Leeds-York and inter-city Manchester Airport-Piccadilly-Victoria-Huddersfield-Leeds-York services, plus stopping services. This might involve selective four-tracking where possible.
- **A radical, longer-term, high-speed solution (HSN stage 5):** This would involve building a new high-speed base tunnel, on the model of the great trans-Alpine tunnels and similar in length to London's Crossrail tunnel (approximately 13 miles long), from a point immediately north-east of Stalybridge, under the Standedge summit and bypassing the Colne Valley towns, emerging in the Holme Valley south of Lockwood, to Huddersfield. This would dramatically increase speeds and also capacity, leaving the existing 'classic' route for more frequent local trains and for increasing volumes of freight. And, following completion of the Manchester HS2 tunnels, it would provide continuity of work for the tunnelling workforce.

This clearly requires an early consultancy exercise, which should include the potential for large-scale development projects, especially housing, around proposed stops, as well as improved pan-northern high-speed connections to Manchester Airport.

The last 20 miles

From Huddersfield to Leeds-Bradford, one option to increase capacity and cut journey times would be to construct further base tunnels across difficult Pennine terrain northwards to Halifax, Bradford and Leeds. But there is a cheaper and more effective option.

This would parallel the solution for the first 20 miles: a 14-mile upgrade and electrification of the existing, relatively straight and easily graded line (apart from the first four miles out of Huddersfield) from Huddersfield to Wakefield Kirkgate, with no intermediate stations – also serving Halifax and Bradford via the existing, if slow, Bradley and Greetland junctions – plus a new 2.5-mile high-speed link from Wakefield Kirkgate to a bi-directional delta junction with HS2.

This link could be built in two stages.

- First (HSN stage 4A), dependent on feasibility,¹⁴ a short new link would be built to connect into the present Doncaster-Wakefield Westgate-Leeds line south of Wakefield Westgate. This would give direct access to the present Leeds station via the existing line, with services continuing onwards to York and the North East.
- Second (HSN stage 4B), the HS2 link, via the recently restored Wakefield Kirkgate station,¹⁵ would be built simultaneously with the 9-mile northernmost section of the HS2 Yorkshire arm, offering through high-speed running into Leeds.¹⁶

‘By the end of the first third of the century, the great cities of the North, plus many of its major towns, would at last be linked by a truly 21st-century railway spine, bringing them dramatically closer in terms of journey times. As a new northern mega-city is born, the benefits to their economies will be incalculable’

This link would simultaneously:

- connect HSN directly into the new Leeds HS2 station;
- connect directly to York and Newcastle via the eastern arm of the Yorkshire HS2, and
- on completion of HS2, provide direct services from HS2 to Wakefield, Huddersfield, Halifax, and (by a relatively slow route) Bradford. Bradford, currently served via interchange at Leeds to the 10-mile line to Bradford Interchange, has almost

certainly the worst inter-city service of any major British city; providing a fast direct service presents unusual difficulties.¹⁷

Achieving High-Speed North: a five-stage programme

HSN thus could and should be achieved in five stages, starting (well ahead of HS2) with Liverpool-Manchester electrification at the end of this year, and extending in a carefully phased and funded programme over 20 years, to 2034:

- **HSN Stage 1:** The Liverpool-Manchester electrification to be completed and opened in December 2014 (in the final year of Network Rail’s Control Period 4), plus onward electrification to Stalybridge (under phase 5 of North West electrification, to be completed in December 2016), reducing overall Liverpool-Leeds best journey times from 107 minutes to around 82 minutes.
- **HSN stage 2:** Electrification from Stalybridge to Leeds (scheduled for completion in 2018) plus track improvements between Manchester and Stalybridge as an extension of the Northern Hub programme (also scheduled for completion by December 2018, within Network Rail’s Control Period 5, 2014-19), coupled with a new trans-Pennine franchise (not yet committed) offering a Liverpool-Manchester-Leeds-York-Newcastle electric Pendolino train service. This completes the ‘base case’ upgrading, already programmed, and should reduce total Liverpool-Leeds journey times by a further ten minutes.
- **HSN stage 3:** The new high-speed line from Liverpool (the western end of the M62) to Parkside junction, to be built in Network Rail’s Control Period 6, 2019-24, producing a further reduction of journey times.
- **HSN stage 4:** Improved line speeds between Huddersfield and Wakefield and connecting first, if feasible (stage 4A), to Wakefield Westgate, and then (stage 4B) to the northernmost section of HS2 via Wakefield Kirkgate into Leeds, further reducing times (within Network Rail’s Control Period 7, 2024-29).
- **HSN stage 5:** The Stalybridge-Huddersfield base tunnel, reducing Liverpool-Leeds journey times by a further ten minutes, to about 55 minutes (within Network Rail’s Control Period 8, 2029-34).

Thus, simultaneously with the full opening of HS2 Phase 2, completion of HSN stage 5 would produce a Liverpool-Leeds journey time comparable with times currently achieved on the best parts of the existing national rail system – and would also release capacity on existing classic-network routes for much improved regular-interval commuter and local services, serving smaller towns and suburban and rural centres. By the end of the first third of the century, the great cities of the North, plus many of

its major towns, would at last be linked by a truly 21st-century railway spine, bringing them dramatically closer in terms of journey times. As a new northern mega-city is born, the benefits to their economies will be incalculable.

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Notes

- 1 D. Higgins: *HS Plus*. Department for Transport, Mar. 2014. <http://assets.hs2.org.uk/sites/default/files/inserts/Higgins%20Report%20-%20HS2%20Plus.pdf>
- 2 A. Chape and I. Wray: 'Closing the gap – the case for two English super-cities'. *Town & Country Planning*, 2014, Vol. 83, Apr., 168-173
- 3 'Never walk alone'. *The Economist*, 19 April 2014, pp. 27-28. www.economist.com/news/britain/21601034-northern-solidarity-could-give-britain-big-economic-boost-never-walk-alone
- 4 P. Lucci and P. Hildreth: *City Links: Integration and Isolation*. Centre for Cities, 2008. www.centreforcities.org/research/2008/03/18/citylinks/
- 5 C.-L. Chen and P. Hall: 'The wider spatial-economic impacts of high-speed trains: a comparative case study of Manchester and Lille sub-regions'. *Journal of Transport Geography*, 2012, Vol. 24, Sept., 89-110; P. Hall and C.-L. Chen: 'Using HS2 to irrigate the regions'. *Town & Country Planning*, 2013, Vol. 82, Apr., 170-4
- 6 The alternative connection, Liverpool-Manchester-Sheffield, has fewer people and is less immediately attractive, particularly because the onward links east of Sheffield offer less traffic. It will not be practicable to propose both corridors at the outset
- 7 European Rail Traffic Management System (ERTMS) Level 2 and European Train Control System (ETCS) in-cab signalling
- 8 *Modern Railways*, April 2014, p.16
- 9 *Modern Railways*, April 2014, p.51
- 10 Parkside Colliery, opened in 1964 and closed in 1992, was the largest and most modern colliery in Lancashire, employing 1,400 men, and the last to close. Sir James Drake (1907-89), Lancashire County Council County Surveyor and Bridgemaster, is widely recognised as the 'Father of the UK motorway system'
- 11 A flat junction, where the two lines cross immediately west of the Ordsall Curve, may eventually need to be resolved by grade separation
- 12 This will critically depend on modification of the proposed HS2 route, on its approach to the Piccadilly terminus, to incorporate a spur over the existing tracks to new Piccadilly platforms 15 and 16, converging with existing platform 13 and 14 tracks west of the London Road overbridge
- 13 They will depend on successful completion, testing and monitoring of the national tram-train trial on the Sheffield-Rotherham line, in 2016
- 14 Oddly, no such link has ever existed. The new link would involve contentious demolition in an established inner-city residential area
- 15 Kirkgate, a city centre station with easy access from M1 junctions 39 and 40 and generous parking space, appears on balance superior to the alternative, a pure park-and-ride station close to junction 39, which presents difficult problems of access across the River Calder
- 16 The best connection to HS2 would be from the Wakefield-Doncaster line south-east of Wakefield – preferable to the alternative Wakefield-Castleford-York line east of Wakefield, as it is closer to the division between the Leeds and York branches of HS2 south of Leeds and also because it offers a longer transition (2.5 miles) for deceleration/acceleration between the high-speed line and the Wakefield stop
- 17 There is a possible link from Leeds, from HS2 just south of the HS2 station – but, oddly, missing the station. The design of the HS2 station, a terminus at right angles to the existing station, connected only via a long walk or travelator link, presents fundamental difficulties in integration, and requires re-examination. But even a through link from Wakefield via the existing station is a logistical impossibility, because of the track configuration