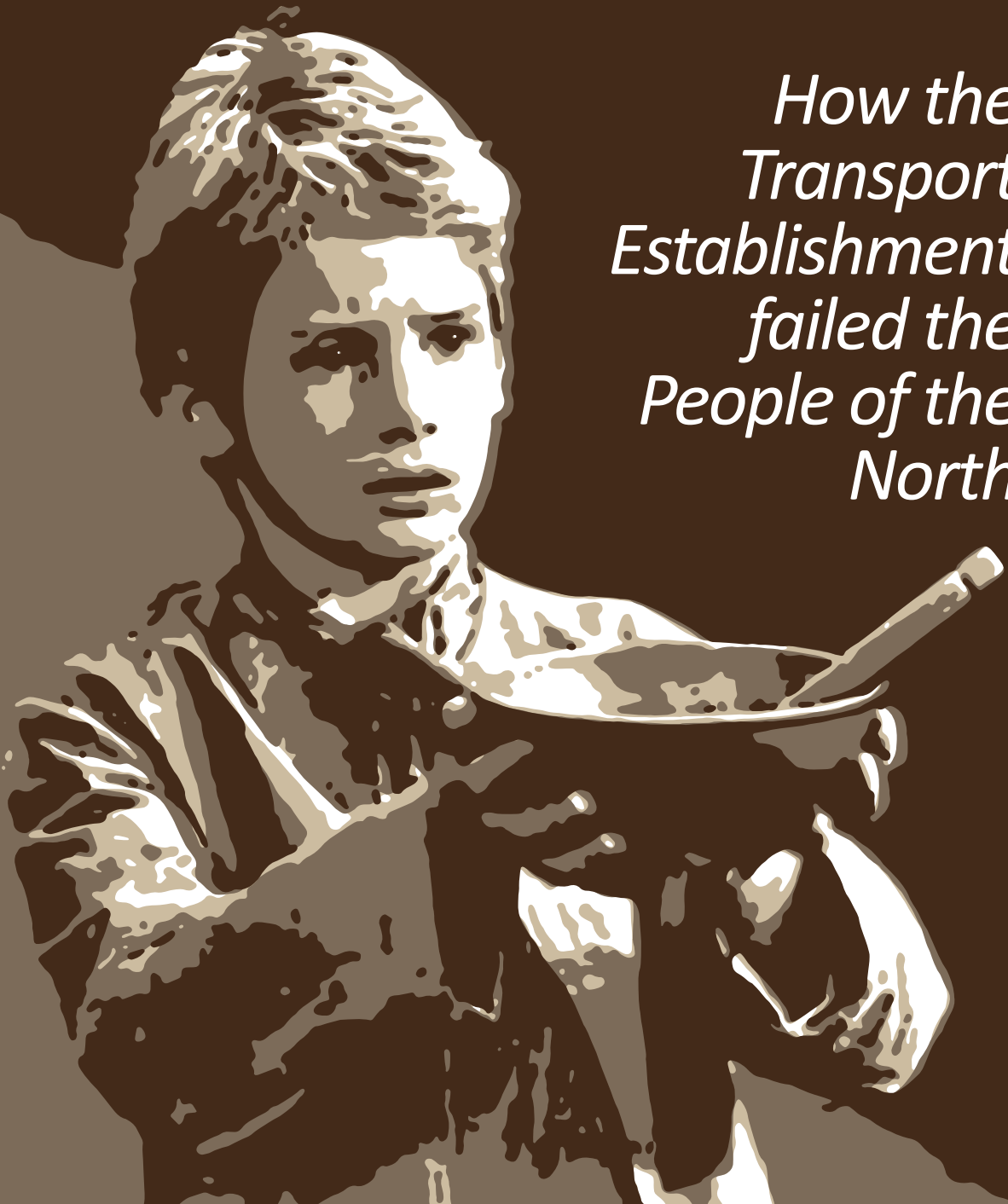


The Northern Poorhouse

*How the
Transport
Establishment
failed the
People of the
North*



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The Northern Powerhouse

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1. Executive Summary

In June 2014, then-Chancellor George Osborne launched the Northern Powerhouse initiative. The aim of the Northern Powerhouse was to address the historically poor economic performance of the North by bringing together its major conurbations – Merseyside, Greater Manchester, South and West Yorkshire, Humberside and the North-East – to form a single aggregated unit of over 10 million population, capable of competing with Greater London and the Midlands, and also on a wider international stage.

The concept of improved 'HS3' transpennine high speed rail links, with a new transpennine route for passengers and freight, sprang from the Chancellor's initiative, and a specification for radically reduced intercity journey times was swiftly established. Since 2014, Transport for the North (TfN) has been working to develop proposals for improved rail links between Northern cities that will stimulate the region's economy, and redress the natural London-centricity of the Government's proposed 'Y-network' of HS2 high speed lines. In January 2018, TfN released its proposals for a 'Northern Powerhouse Rail' network of new routes linking the principal cities of the North.

The purpose of this report is to determine whether the TfN proposals:

- meet the 'HS3' journey time specification (see **Section 3.2**);
- satisfy a wider 'Requirements Statement' (see **Appendix D**) developed to ensure efficient and effective performance of an enhanced Northern Powerhouse rail network;
- represent an optimised scheme, delivering the greatest gains in rail network connectivity and capacity for the least cost.

To determine this last point, the performance of TfN's proposals on all aspects of the Requirements Statement has been contrasted against the performance of the 'Exemplar Alternative' of the High Speed UK (HSUK) scheme. Details of the HSUK proposals for a national system of high speed lines, fully integrated with the existing railway network, are presented in **Appendix B**.

This report concludes that TfN's Northern Powerhouse Rail proposals fail every test for a well-performing rail network; and the primary reason for this failure is Transport for the North's misplaced priority upon developing proposals that conform with the established HS2 scheme, rather than comply with the core specification for radically reduced intercity journey times set out in **Section 3.2**. TfN's proposals:

- fail to meet TfN's own specification for reduced intercity journey times (**see Section 7.1.1**);
- fail to provide the new track capacity necessary for increased intercity, local and freight services (**7.1.2**);
- offer no vision for how the Northern Powerhouse's principal stations can be developed to meet the capacity challenges of the anticipated step-change increase in rail services (**7.1.3**);
- are compromised by inadequate station proposals, especially for Manchester and Manchester Airport (**7.1.4**);
- offer poor interconnectivity between the many smaller Northern Powerhouse cities (**7.1.5**);
- are hugely compromised by HS2's inadequate links from Northern cities to other regions (**7.1.6**);
- fail to provide the specified new transpennine route essential for improved freight connections between ports, industry and population centres (**7.1.7**);
- are effectively predetermined by proposed HS2 routes, and as a result fail to achieve the required benefits of improved capacity, improved connectivity or radically reduced journey times (**7.1.8**);
- fail to offer the vision for a better-connected and more prosperous Northern Powerhouse (**7.1.9**).

The failure of the TfN scheme is proven by HSUK's massive superiority on every one of the above points.

High Speed UK is not simply technically superior to the TfN Northern Powerhouse Rail proposals. It also meets all of the fundamental political goals set by the 'One North' group in their 2014 *Proposition for an Interconnected North*¹:

- **Passenger Services:** HSUK will deliver the 'One North' requirement for radically improved intercity journey times between the principal cities of the North, and from these principal cities to Manchester Airport, with services focussed on city centre 'hub' stations.
- **Freight Services:** HSUK will realise the 'One North' ambition for a transformation of the region's railfreight network, to efficiently connect its industry, its ports and its major population centres.
- **New Transpennine Rail Route:** HSUK will deliver the 'One North' requirement for a new transpennine rail route for both passengers and freight. This will connect Merseyside and Greater Manchester to South and West Yorkshire, and also to the North East.

On any objective analysis of Transport for the North's *Strategic Transport Plan*, it is clear that over the past 4 years, the Northern Powerhouse Rail project has regressed, rather than progressed:

- The journey time targets set by 'One North' have been abandoned.
- No vision is put forward for a transformation of freight services in the Northern Powerhouse region.
- The new transpennine rail route proposed by TfN is hugely suboptimal in terms of its cost and connectivity performance, and it makes no provision for freight.

The abandonment of the HS3 journey time specification established by 'One North' raises particular concern. No explanation has been offered for its omission, and it seems fair to state that during the development of its proposals over the past 4 years, it must have become increasingly obvious to Transport for the North that – as shown in **Section 7.1.1** – their proposals would fail to meet many aspects of the HS3 Specification, or the wider political objectives of the 'One North' group.

The primary reason for Transport for the North's failure appears to be the mistaken core assumption that Northern Powerhouse Rail routes should be based upon the established HS2 proposals (see **Section 3.6**, **Section 7.1.8** and **Appendix E8**). The fundamental illogicality of basing new transpennine rail routes upon the northern sections of HS2, which were designed with no thought for transpennine connectivity, appears to have gone completely unrecognised by TfN's experts. It can only be speculated as to whether the presence of an HS2 Ltd representative on the TfN 'Partnership Board' (see **Appendix C**) has contributed to this myopia.

Whatever the case, it is plain that the priorities of Transport for the North's experts have been entirely misplaced. Rather than develop the integrated railway network that is essential to deliver the Northern Powerhouse and all of its promised economic benefits for the people of the North, their first priority has been to develop proposals that conform with the established HS2 scheme.

¹ *One North : A Proposition for an Interconnected North*, 'One North' group of city councils, July 2014

2. Introduction

There has been a long-standing and widespread perception that the Government's HS2 scheme, configured as a London-centric 'Y-network'², was unlikely to offer meaningful benefit to the North of England, or indeed any other UK region. Instead, HS2 seemed far more likely to suck wealth and economic activity towards the South and thus reinforce, rather than remedy the North-South Divide.

Political pressure from Northern communities led ultimately to the launch in June 2014 of George Osborne's Northern Powerhouse initiative. This included an 'HS3' concept for a transpennine high speed line that would connect the principal cities of the North, and thus redress the London-centricity of the HS2 'Y'. The HS3 concept was rapidly augmented by more detailed proposals from the 'One North' group of Northern city councils which established a specification for reduced journey times between the principal cities of the North, and from these cities to Manchester Airport.

Compared with HS2, proposals for HS3 (or Northern Powerhouse Rail/NPR) have been slow to advance towards a meaningful level of detail. Transport for the North's (TfN) January 2018 *Strategic Transport Plan*, setting out proposals for its Northern Powerhouse Rail network of new and enhanced rail routes is still essentially at conceptual stage. However, sufficient detail now exists to allow:

- Definitive assessment of the TfN proposals' performance in meeting the HS3 journey time specification.
- Definitive assessment of the TfN proposals' broader performance as a railway network.
- Comparison with alternative high speed rail proposals to determine whether TfN's Northern Powerhouse Rail represents an optimised scheme that is best for the North, and best for the UK.

These questions can only be resolved through the establishment of a balanced specification, or 'Requirements Statement', which should define all aspects of how the railway network of the North should perform, in order to deliver maximised benefits for the people of the North. This Requirements Statement would naturally incorporate the specification for reduced intercity journey times originally put forward by the 'One North' group.

The aim of this report is to:

1. Formulate a Requirements Statement (see Appendix D) for Northern Powerhouse Rail.
2. Assess the performance of the TfN proposals against this Requirements Statement.
3. Determine whether the TfN proposals represent the optimal scheme that its promoters claim.

This third criterion, of optimal performance, cannot be determined in isolation. Any judgment upon optimal performance can only be made through comparing the TfN proposals against an equivalent 'exemplar alternative', another high speed rail proposal that connects the key cities of the North. To this end, all of this report's technical assessments of the TfN Northern Powerhouse Rail scheme are accompanied by a parallel assessment of the High Speed UK (HSUK) scheme. Details of HSUK are given in Appendix B.

Given the resources so far devoted to the development of TfN's Northern Powerhouse proposals, it would be reasonable to expect these proposals to perform well on any technical comparison.....

² A more detailed description of the proposed HS2 'Y-network' is given in Appendix A.

3. Background to Launch of TfN's *Strategic Transport Plan*

3.1. George Osborne Initiative for Northern Powerhouse

In June 2014, then-Chancellor George Osborne launched the Northern Powerhouse initiative. The aim of the Northern Powerhouse was to address the historically poor economic performance of the North by bringing together its major conurbations – Merseyside, Greater Manchester, South and West Yorkshire, Humberside and the North-East – to form a single aggregated unit of well over 10 million population. This would be capable of competing with Greater London and the Midlands, and also on a wider international stage.

However, if the Northern Powerhouse was to perform effectively as a single economic unit, transport links between its major cities would have to be radically improved. The existing links, especially across the Pennines – either by road or rail – were slow and congested, and were clearly hampering economic performance. The imperative for improved links between the Northern cities was already self-evident; but it was greatly amplified by the developing plans for HS2³ which would see Northern cities' north-south rail links to Birmingham and London radically enhanced. With no equivalent improvement of links between Northern cities, or indeed to other UK regional cities, HS2 seemed likely to suck economic activity out of the North unless it was complemented by equivalent links between the Northern cities.

These concerns, of unbalanced development of the national rail system, gave rise to the sustained political pressure from regional political and business groups which ultimately led to George Osborne's initiative for the Northern Powerhouse.

3.2. Launch of 'One North' Initiative

The Chancellor's June 2014 Northern Powerhouse initiative included the concept of an 'HS3' transpennine link, but gave no supporting detail. One month later, in July 2014, the 'One North' group (comprising the city councils of Liverpool, Manchester, Sheffield, Leeds and Newcastle) published a more detailed scheme⁴ for improved rail links across the North.

The 'One North' initiative, depicted in graphic form in Figure 1, comprised 4 essential requirements:

- Radically improved intercity journey times between the principal cities of the North, and from these principal cities to Manchester Airport.
- Improvements to be focussed on existing city centre 'hub' stations.
- A transformation of the region's railfreight network, to efficiently connect its industry, its ports and its major population centres.
- A new transpennine rail route for both passengers and freight, connecting Merseyside and Greater Manchester to South and West Yorkshire, and a new rail route connecting Yorkshire to the North East.

These requirements – which represent the core political goals of the city councils that formed the original 'One North' group – are discussed in further detail in Sections 3.2.1, 3.2.2, 3.2.3 and 3.2.4.

³ The London-centric layout of HS2 is described in Appendix A.

⁴ *One North : A Proposition for an Interconnected North*, 'One North' group of city councils, July 2014

Extracts from *One North – A Proposition for an Interconnected North*, July 2014.
P26, P27 & P31

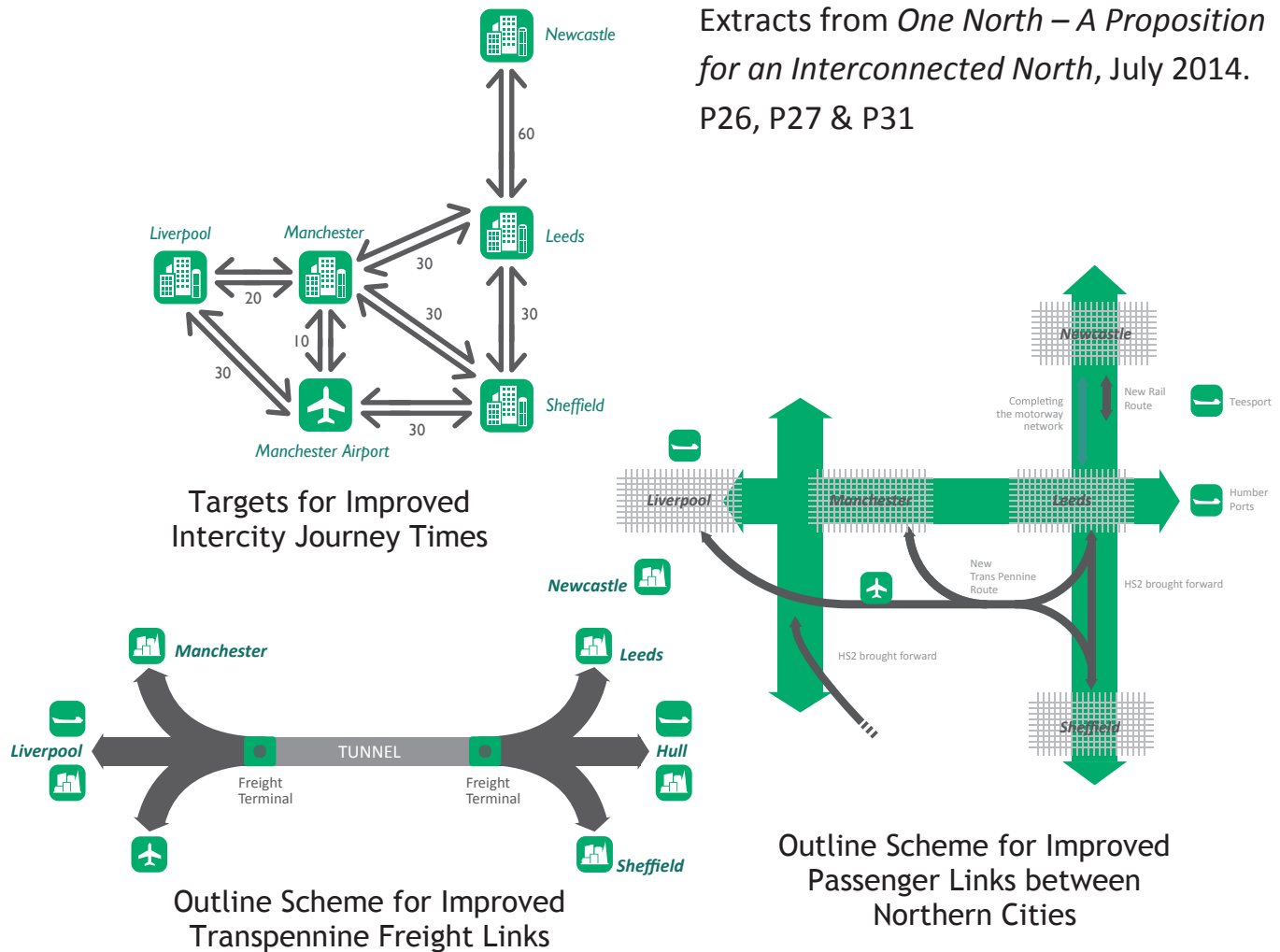


Figure 1 : Key Elements of the 'One North' Initiative (2014)

The 'One North' *Proposition for an Interconnected North* report established⁵ an unambiguous requirement for a mixed-use passenger and freight 'transpennine corridor' that would transform rail connectivity across the North. This 'transpennine corridor' would comprise the following key features:

- A new east-west express passenger route crossing the Pennines, with the primary aim of linking Manchester to Sheffield and Leeds.
- Westward extension of the new transpennine line to Manchester Airport, Liverpool and Chester.
- Connection to (and integration with) the north-south HS2 line to enable services using the new transpennine line to access east-sided cities such as Newcastle, York, Hull and Nottingham.
- Parallel use of the new 'transpennine corridor' by long distance railfreight, presumably on separate tracks from the express passenger services.
- A potential Channel Tunnel-style 'lorry shuttle' operation between terminals either side of the Pennines.

It is appropriate to reproduce the text from Page 31 of the 'One North' *Proposition for an Interconnected North*. This sets out in full the 'One North' vision for how a railway network might develop in the North of England, to meet the core objectives of radically reduced intercity journey times and transformed freight connectivity, as set out in Figure 1.

⁵ P31, *One North : A Proposition for an Interconnected North*, 'One North', July 2014

(The new transpennine corridor)... might be developed in phases, but will require tunnelling and take time to build. It should allow for speeds of 125MPH and our target of a 30 minute journey time between Manchester, Leeds and Sheffield city centres. The key to success is to ensure that the route is well connected to both the east and west and designed to dovetail with HS2, enhancing its benefits. On the eastern side it should link into the north-south HS2 line with a delta junction arrangement to allow fast services from northern centres such as Newcastle, York and Hull as well as centres in the Midlands and the south, such as Nottingham, to access the route. To the west, the line should serve Manchester Airport directly, and Liverpool/Chester as well as Manchester city centre. But we also need to see connections with the existing rail network for long distance railfreight. We will need to examine the case for purpose-designed terminals so that the corridor can offer a drive-on facility for road freight too, in the style of Eurotunnel. This could offer an all-weather transpennine freight capability, and in the longer term help transform the freight functionality of the North.

This text describes the key features of the 'One North' scheme and sets out its 'geographic logic' as discussed in Section 3.3.

3.2.1. 'One North' Rationale for Intercity Journey Time Targets

The targeted reductions in journey times, generally to 30 minutes or less between the close-spaced cities of Liverpool, Manchester, Sheffield and Leeds, would represent a step-change improvement in intercity connectivity. The greater ease of communication between the North's principal cities is anticipated to deliver major economic benefit, and it is broadly proportionate (see Table 2) to what HS2 will achieve on its primary routes to London.

	Intercity Journey	Existing Journey Time (mins)	Proposed Journey Time (mins)	Percentage Improvement	Straight Line Distance (km)	Average Speed (km/h)
Northern Powerhouse	Leeds-Manchester	49	30	39%	57	115
	Leeds-Sheffield	40	30	25%	47	94
	Sheffield-Manchester	48	30	37%	52	104
	Liverpool-Manchester	32	20	37%	50	151
	Leeds-Newcastle	82	60	27%	131	131
HS2	Leeds-London	131	81	38%	270	200
	Manchester-London	127	67	47%	260	232
	Birmingham-London	84	49	42%	161	197

Table 2 : Existing and Proposed Journey Times for Northern Powerhouse Rail and HS2

However, when the 'One North' journey time targets are examined in the context of the average speeds that they will offer between the principal cities of the North, it is immediately apparent that they are an order of magnitude below what HS2 will offer on its longer distance routes. These speeds – ranging from 94km/h (58MPH) to 151km/h (94MPH) – are well within the capability of even conventional rolling stock used for express passenger services operating at 201km/h (125MPH) maximum speed.

So, given the 'One North' ambition for new lines to link the major cities of the Northern Powerhouse, their targets for reduced intercity journey times appear to be eminently reasonable and achievable. Rather than view these simply as targets to be reached, they should be viewed as the minimum requirements, as targets to be exceeded by the greatest possible margin.

The value of reduced intercity journey times is encapsulated in Transport for the North's '60-minute Criterion', described in Section 6.2 and tested in Section 7.2.

3.2.2. 'One North' Rationale for City Centre Stations

Whilst the journey time targets put forward by the 'One North' group concern only intercity links between the principal cities of the North, it is commonly acknowledged that there is a parallel demand for a similar scale of improvement in the suburban and interurban rail networks focussed upon each principal city. It has so far been assumed that the intervention of new high speed rail lines will release the capacity on the existing network to allow increased suburban and interurban services to operate.

There is a clear need for these improved local networks around the North's principal cities to be fully integrated with 'HS3' links between these principal cities. This dictates that high speed and local services should operate from a single central hub in each city; where possible, the existing city centre station should be developed for this purpose.

Without this integrated operation, it will not be possible to extend the benefits of the reduced journey times between the North's principal cities to more than a very small proportion of the North's 10 million or more citizens.

3.2.3. 'One North' Rationale for Transformed Railfreight Links

The economic performance of the North is greatly hampered by the poor freight links that exist between its industry, its ports and its major population centres. With only limited prospect of major gains in the capacity of the currently dominant road transport sector, the 'One North' *Proposition for an Interconnected North* identifies rail as the primary mode by which freight transport can be improved, and in so doing facilitate major developments such as Liverpool Superport (also widely known as either 'Liverpool2' or 'Atlantic Gateway').

It is important to appreciate the potential scale, in railway terms, of the Liverpool Superport development. Liverpool Superport is designed to handle container ships of up to 20,000 TEU (twenty-foot equivalent unit) capacity. To avoid unacceptable congestion in suburban Liverpool and on arterial motorway routes, most containers will have to be taken from the port by rail; this would require of the order of 200 trains 775m long. Assuming a broadly 50:50 split of the Northern Powerhouse's population to either side of the Pennines, this would indicate around 100 container trains crossing the Pennines for each ship that is unloaded. This is clearly far beyond the capacity of the existing rail network.

The 'One North' *Proposition for an Interconnected North* also identifies⁶ the opportunity for a Channel Tunnel-style shuttle operation to transport lorries across the Pennines, and thus avoid the congestion on transpennine routes, in particular the M62 and the A628(T) Woodhead Road. Again, with aggregate daily flows of around 10,000 HGVs in each direction (and over 1,000 HGVs running via Woodhead, causing crippling congestion), this creates another imperative for new railway construction or restoration.

⁶ P31, *One North : A Proposition for an Interconnected North*, 'One North', July 2014

However, any development of the railfreight network must first address its many existing deficiencies, in particular the lack of any viable cross-Manchester and transpennine freight route.

3.2.4. 'One North' Rationale for New Transpennine Rail Route

Whilst it would not seem practicable to build new infrastructure between all of the North's principal cities, it would equally not appear possible to achieve the required improvements, in intercity passenger links, in local passenger links and in railfreight links, without the intervention of new railways at the core of an enhanced regional (and national) network.

It should not be forgotten that exactly the same logic has applied in the development of HS2. To achieve its aim⁷ of '**hugely enhanced capacity and connectivity**' between the UK's major conurbations, HS2 Ltd has correctly dismissed the concept of further upgrading the nation's existing principal routes such as the West and the East Coast main lines; instead, it has opted for new-build railways to form all of its primary routes, and achieve the radically reduced journey times noted in Table 2.

3.3. Geographic Logic of 'One North' Initiative

The 'One North' *Proposition for an Interconnected North* not only set out journey time targets for enhanced links between the North's primary cities, it also provided a geographic vision for a new network linking these cities.

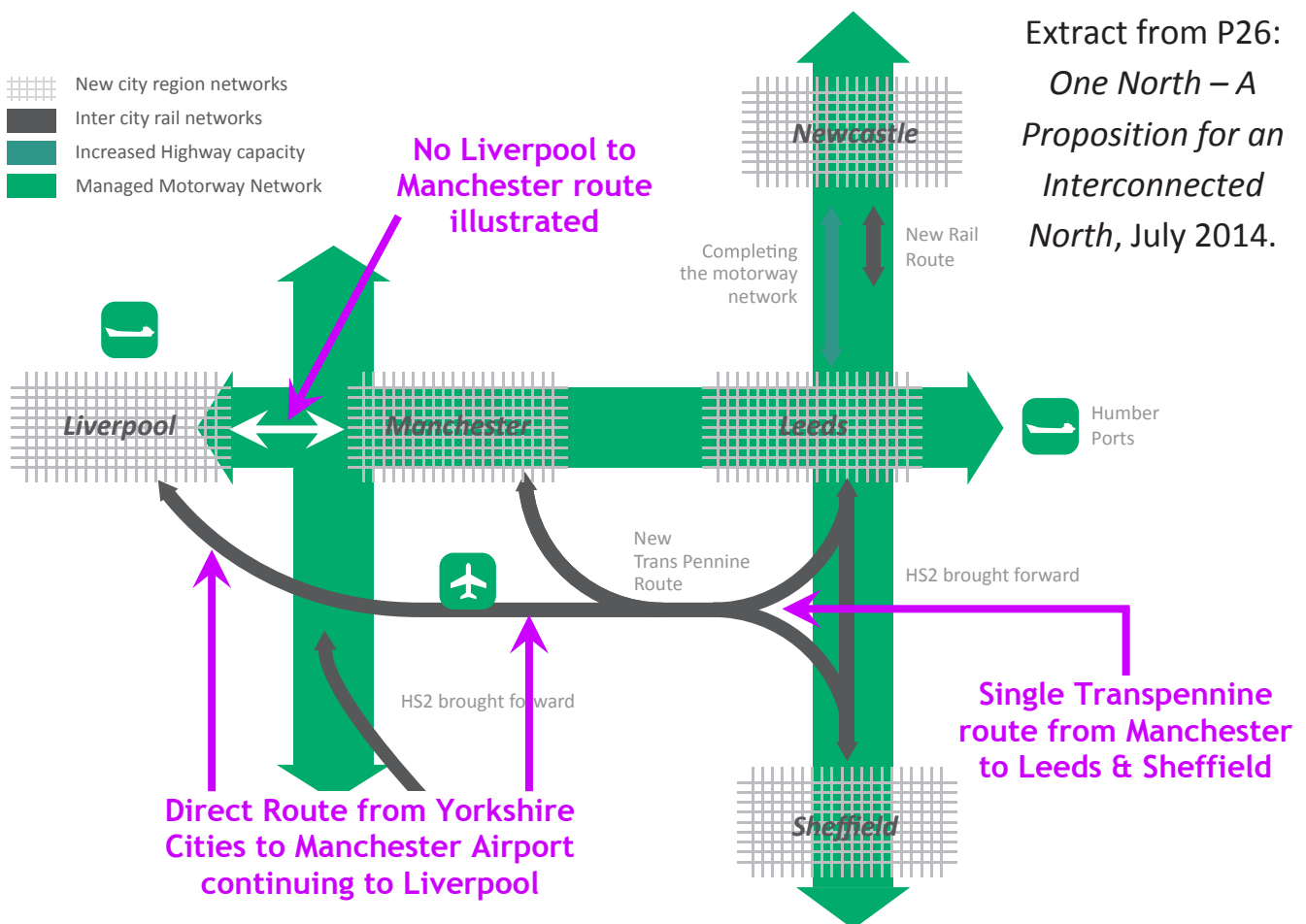


Figure 3 : 'One North' Requirements for New 'HS3' Routes

⁷ On 30th November 2015, HS2 Ltd Technical Director Andrew McNaughton informed the HS2 Select Committee that: "The aim of the HS2 project is to deliver hugely enhanced capacity and connectivity between our major conurbations."

Whilst the 'One North' vision reproduced in Figure 3 is highly diagrammatic, with little apparent relationship to geographic reality, it is still possible to infer 3 clear requirements for new 'HS3' routes:

- **A new northward route from Yorkshire to the North-East.** Such a route, broadly aligned with the existing East Coast Main Line, implicitly acknowledges the capacity pressures that exist along this congested corridor, and the impracticality of achieving major journey time savings given the fact that most if not all upgrade opportunities have already been exploited.
- **A single new transpennine route capable of providing direct links from Manchester and Manchester Airport to Leeds and Sheffield, and integrated with the north-south HS2 route in Yorkshire.** Such a route must logically be located south of Leeds and north of Sheffield, in an intermediate position between the existing Manchester-Leeds 'Diggle' route and the Manchester-Sheffield 'Hope Valley' route. This effectively specifies the former Manchester-Sheffield 'Woodhead' route (closed to passengers in 1970 and closed to freight in 1981). There is no other corridor that aligns with the aspiration⁸ for a single new transpennine route, meeting HS2 at a 'delta junction', from which trains would continue either north to Leeds or south to Sheffield.
- **A new westward route running via Manchester Airport to Liverpool.** Such a route should radically transform rail access to Manchester Airport from all the principal cities of the Northern Powerhouse region. However, it is less certain whether this route is intended also to be the primary transpennine route to Liverpool. The journey time targets shown in Figure 4 clearly indicate a faster Sheffield-Liverpool route via Manchester than via Manchester Airport, and this would seem to require a transpennine trunk route running through central Manchester, possibly with tunnelled platforms below Manchester Piccadilly.

Sheffield-Liverpool: Route via Manchester	Target Journey Time (mins)	Sheffield-Liverpool: Route via Manchester Airport	Target Journey Time (mins)
Sheffield-Manchester	30	Sheffield-Manchester Airport	30
Manchester-Liverpool	20	Manchester Airport-Liverpool	30
Total	50	Total	60

Table 4 : Sheffield-Liverpool Journey Times via either Manchester or Manchester Airport

With no specific routeing requirements given for a Manchester-Liverpool high speed line, there is certainly no remitted requirement that a high speed line running from Manchester to Liverpool (located 50km to the west of Manchester) should be routed via Manchester Airport (located 12km to the south of Manchester).

⁸ P31, *One North : A Proposition for an Interconnected North*, 'One North', July 2014

3.4. Rationale for a Comprehensive Requirements Statement for NPR

The journey time targets and the aspirations for improved freight routes and a new transpennine main line are essentially political requirements. Much further work is needed to form these requirements into a comprehensive specification (or Requirements Statement) to guide the development of the railway network of the North in such a way that will deliver maximum benefit.

An outline Requirements Statement is set out in Section 6.1 and Appendix D of this report. This establishes the key criteria determining how Northern Powerhouse Rail should perform as a network. It addresses the key requirements of connectivity, capacity, journey time reduction, and accessibility/inclusivity – in other words, gaining the greatest benefits for the greatest number of beneficiaries. None of the requirements should be in any way controversial – they simply state, in a structured fashion, how a railway network should perform to deliver the required capacity, connectivity etc.

3.5. Further Development of HS3/Northern Powerhouse Rail

Since July 2014, Transport for the North (TfN) has been responsible for developing proposals for improved 'HS3' rail links in the Northern Powerhouse region.

In March 2015, TfN published *The Northern Powerhouse : One Agenda, One Economy, One North*, and in March 2016 a further study *The Northern Transport Strategy : Spring 2016 Report* was released. In both reports, the 'One North' journey time specification was endorsed and amplified with the inclusion of Hull (2015) and the addition of targets for train frequency (2016). See Figures 5 and 6.

The 'One North' journey time and train frequency targets were also included in a further TfN report *Initial Integrated Rail Report Strategic Transport Plan Evidence Base*, published in June 2017.

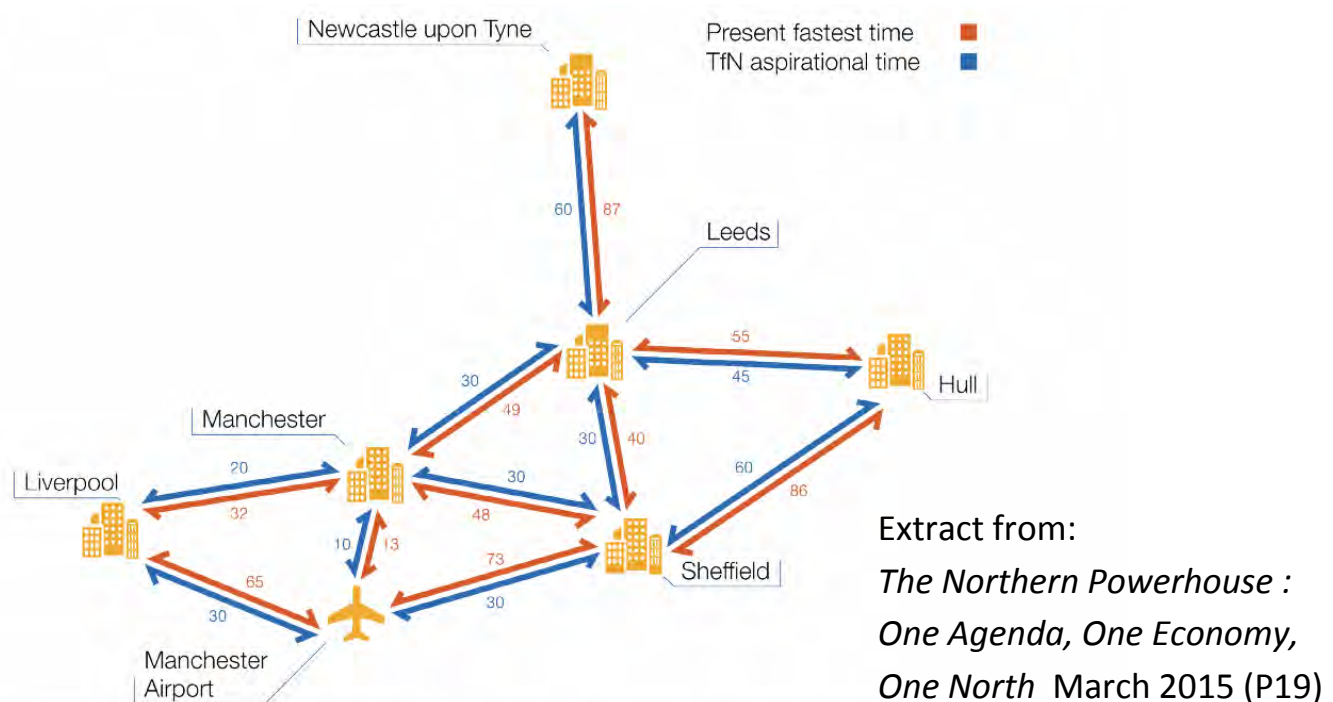


Figure 5 : Northern Powerhouse Rail Journey Time Targets (2015)

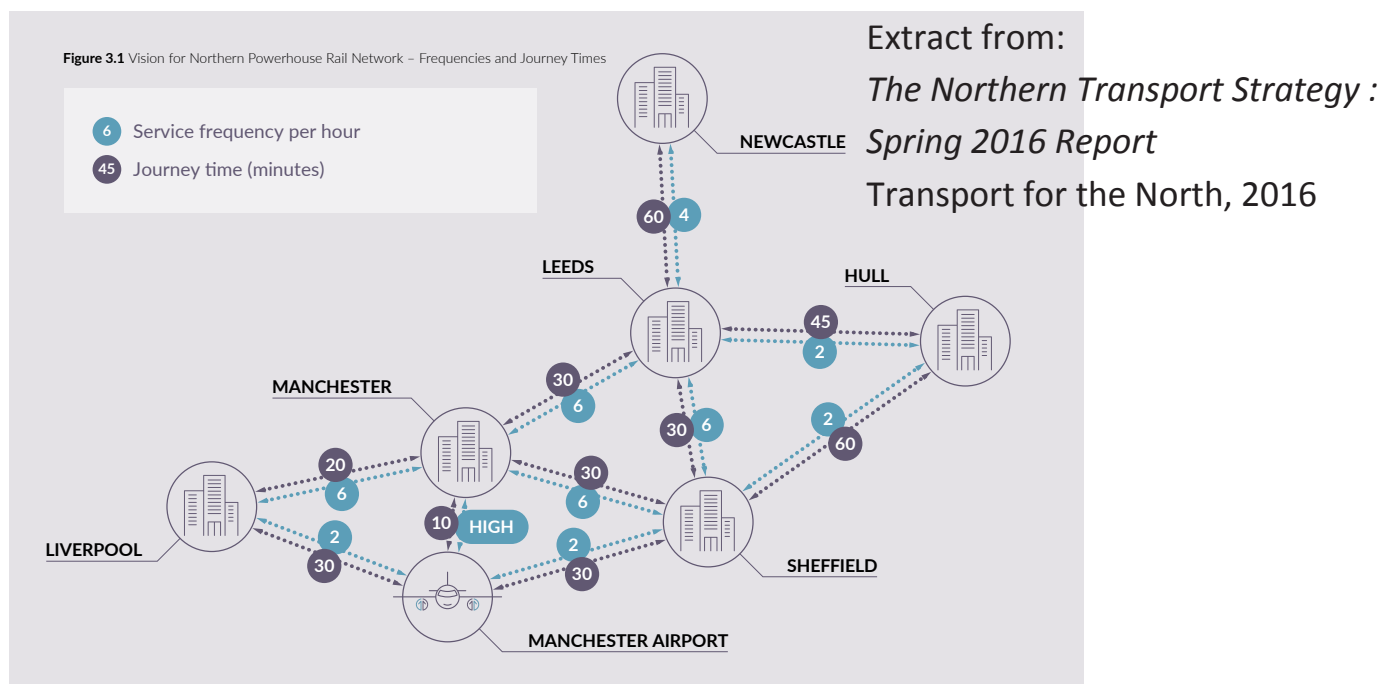


Figure 6 : Northern Powerhouse Rail Journey Time and Train Frequency Targets (2016/17)

The reduced intercity journey times and enhanced train frequencies noted in Figure 6 are hereafter in this report referred to as the 'HS3 Specification'.

3.6. Conflicts between Development of HS2 and Northern Powerhouse Rail

3.6.1. Revised Station Locations in Leeds and Sheffield

During the development of proposals for Northern Powerhouse Rail, considerable pressure was exerted upon HS2 Ltd to revise their station proposals for both Leeds and Sheffield. Under the HS2 Phase 2 proposals (originally released in 2012) Leeds was to be served by the isolated 'New Lane' terminus station, 400m walking distance from the existing Leeds station, and Sheffield was to be served by a new station at Meadowhall, 6km from the city centre. Both proposals were clearly unfit for purpose for a new railway whose primary function was to **'hugely enhance capacity and connectivity'** between the UK's major conurbations. In 2016, revised proposals were released for:

- **Leeds** to be served at its existing 'Leeds City' station, with the HS2 tracks at 'New Lane' extended 400m to the north to form a single station with a common concourse. Due to the north-south alignment of HS2 and the east-west alignment of the existing station, the HS2 element of Leeds station would still comprise a terminus, with no possibility for trains to continue to destinations such as Bradford, Skipton and Harrogate to match current service patterns.
- **Sheffield** to be served at its existing 'Sheffield Midland' station, with HS2 services branching off the trunk route near Alfreton (40km to the south) to join the Midland Main Line south of Chesterfield, and rejoining near Thurnscoe (25km to the north). With the Meadowhall station proposal abandoned, there was now no need for the heavily engineered HS2 new-build line to be routed via Meadowhall, and the HS2 route was revised to run further east, via Mexborough. It is valid to note that while the move to the east might have reduced HS2's engineering difficulties, the number of residential demolitions has hugely increased, with the 'Shimmers' housing estate in Mexborough standing in the path of HS2.

3.6.2. No Fundamental Change to North-South HS2 Route

Whilst local interests successfully lobbied HS2 Ltd to revise their inadequate station proposals for Leeds and Sheffield, there appears to have been no similar questioning of the HS2 route in Yorkshire linking the two cities. This route had been selected by HS2 Ltd with no consideration of transpennine connectivity; its primary aims were to minimise north-south journey times, and to minimise cost, and this led naturally to a route in the less undulating Yorkshire terrain to the east of Barnsley and Wakefield.

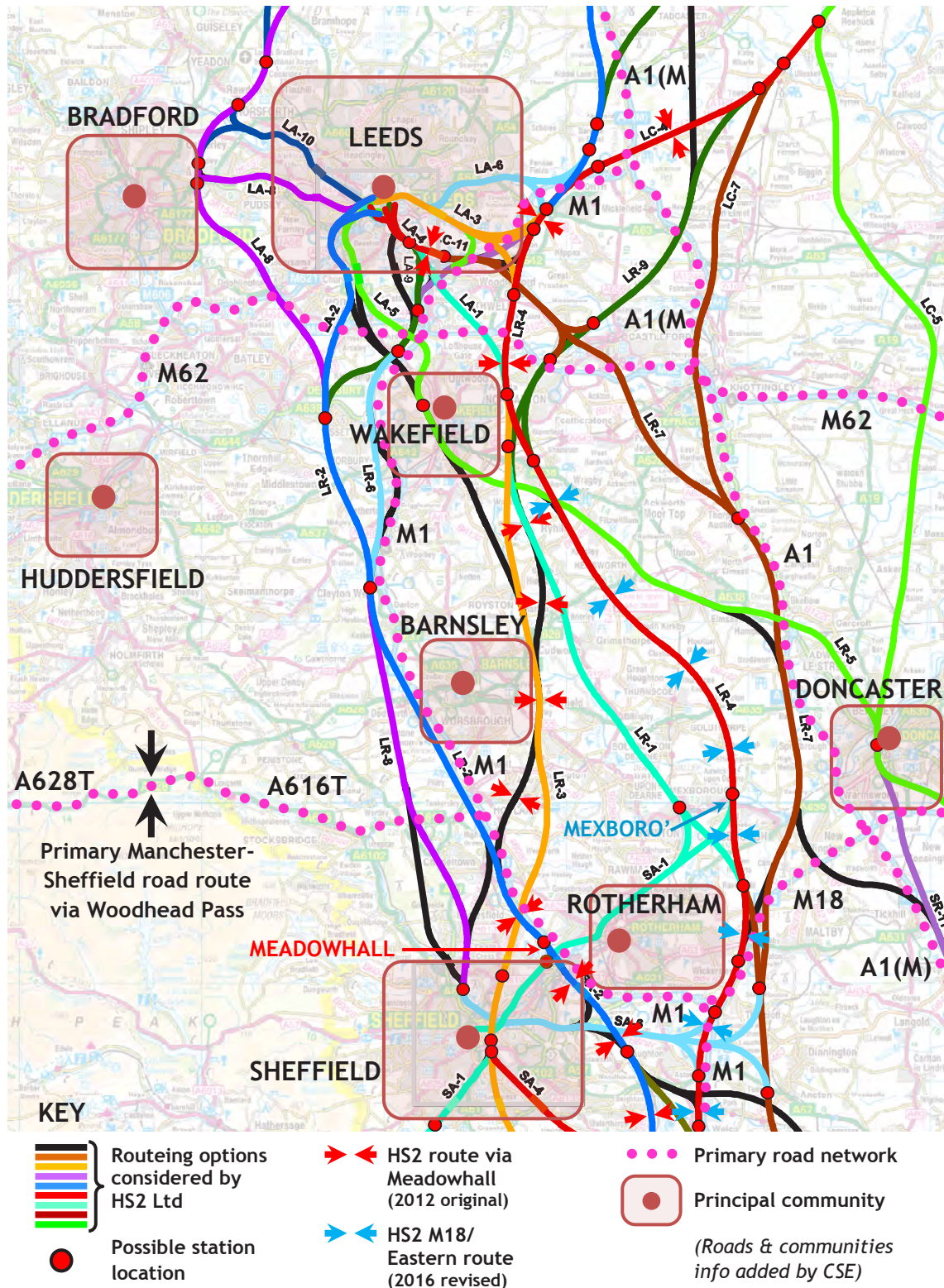


Figure 7 : HS2 Route Options in South and West Yorkshire considered by HS2 Ltd
(Extract from FOI18-1944 response by HS2 Ltd, dated 21 February 2018)

Figure 7 illustrates the full range of route options within Yorkshire that were considered by HS2 Ltd in their development of proposals for Phase 2b of HS2. This proves beyond doubt that HS2's routes within Yorkshire were developed only to deliver north-south connectivity, with no thought whatsoever for future east-west transpennine links. Even routes passing to the west of Barnsley and Wakefield (shown lilac, blue and turquoise), which could make a useful connection to a transpennine route via the Woodhead corridor, appear to have been designed to exclusively north-south priorities. These routes were of course rejected in favour of the selected HS2 alignments – either the original 2012 'Meadowhall' route or the 2016 'M18/Eastern' route – located further east in more favourable terrain.

There is no indication that senior figures at Transport for the North – in their role as transport professionals representing the interests of Northern communities – ever raised with HS2 Ltd the question of whether this HS2 route, running to the east of Barnsley and Wakefield⁹ (see Figure 7), was located too far to the east to be compatible with the 'One North' vision¹⁰ of a single transpennine route, connected to and integrated with HS2 (see Figure 3), and capable of delivering the target journey times of 30 minutes between Manchester, Sheffield and Leeds.

Instead, Transport for the North appears to have accepted the HS2 route without question.

The process by which TfN's Northern Powerhouse Rail proposals have developed from the established HS2 scheme is confirmed in Figure 8. This shows slides from a presentation given by Transport for the North to an Institution of Civil Engineers meeting in Leeds on 21 February 2017. These slides confirm a) that TfN was still working to the HS3 Specification in 2017 and b) that the fundamental design philosophy of Northern Powerhouse Rail is founded upon the established HS2 proposals.

The catastrophic consequences of basing the design of Northern Powerhouse Rail upon the deeply flawed HS2 scheme can only be truly appreciated by comparing the combined performance of HS2 and NPR against an alternative scheme that does not embody this dependency. This is the fundamental purpose of this report.

3.6.3. No Commitment to New Transpennine Rail Route

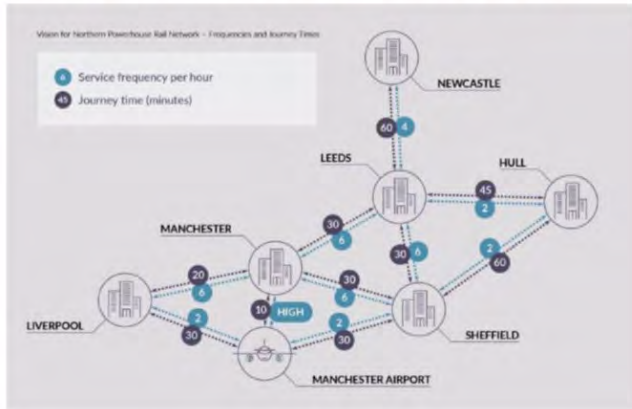
Both of the key TfN reports (*The Northern Powerhouse : One Agenda, One Economy, One North* (2015) and *The Northern Transport Strategy : Spring 2016 Report* (2016) adopted the 'One North' targets for reduced journey times. However it is significant to note that neither report gave any commitment to the 'One North' stipulation for a single new transpennine rail route. Instead, informed sources consistently indicated that Transport for the North's primary focus was directed towards the upgrading of existing routes (in particular, the 'North Transpennine' Manchester-Huddersfield-Leeds route) as the principal strategy for achieving its journey time targets.

During this period of project development, there was also little indication of an emerging strategy for a new transpennine route that might deliver the transformational improvements required for railfreight links within the North.

⁹ The issue of compatibility between east-west 'HS3' routes and north-south HS2 routes is discussed also in Section 7.1.8 and Appendix E8 of this report.

¹⁰ P31, *One North : A Proposition for an Interconnected North*, 'One North', July 2014

Northern Powerhouse Rail Ambitions

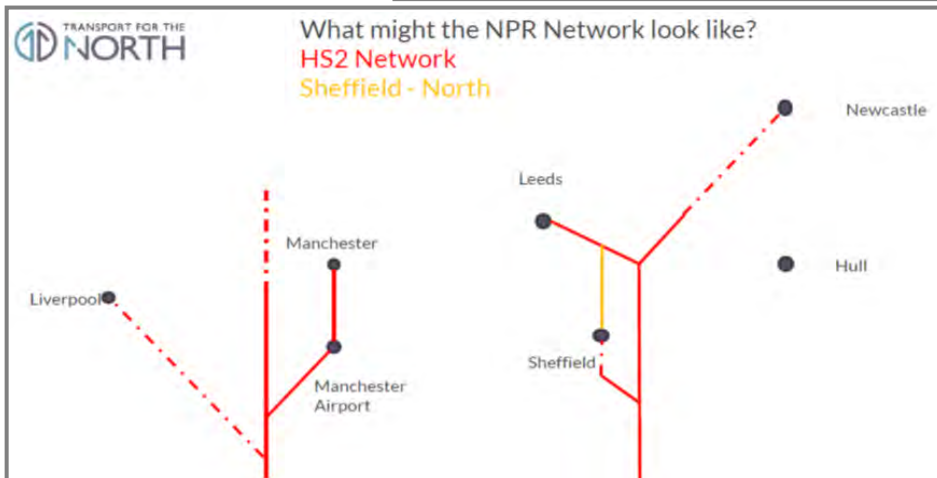
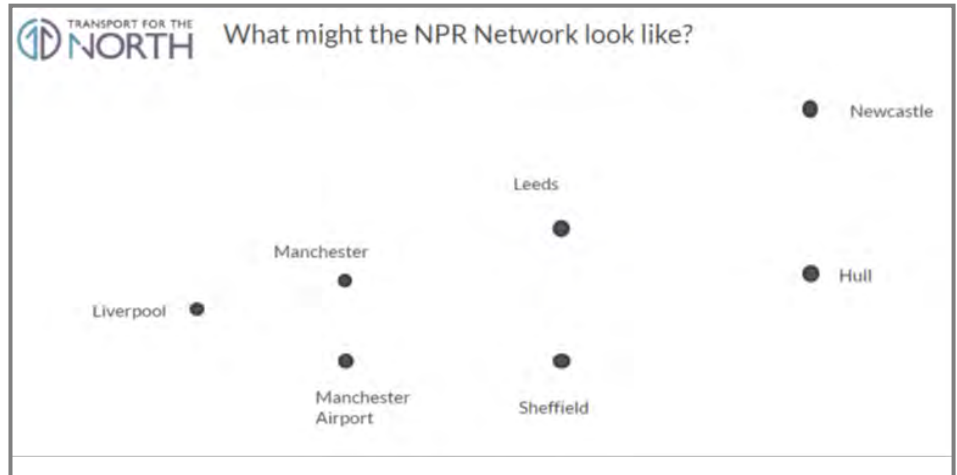


Slide 10/19

‘HS3 Specification’ for intercity journey times and service frequency – as per Figure 6 of this report

Slide 11/19

‘Clean Sheet of Paper’ showing cities and airport to be linked by the ‘NPR Network’



Slide 13/19

Proposals for HS2 ‘Y’, with routes to North-West and to Yorkshire, taken as the basis of the ‘NPR Network’

Slide 14/19

Northern Powerhouse Rail routes then retrofitted onto HS2 to form the ‘NPR Network’

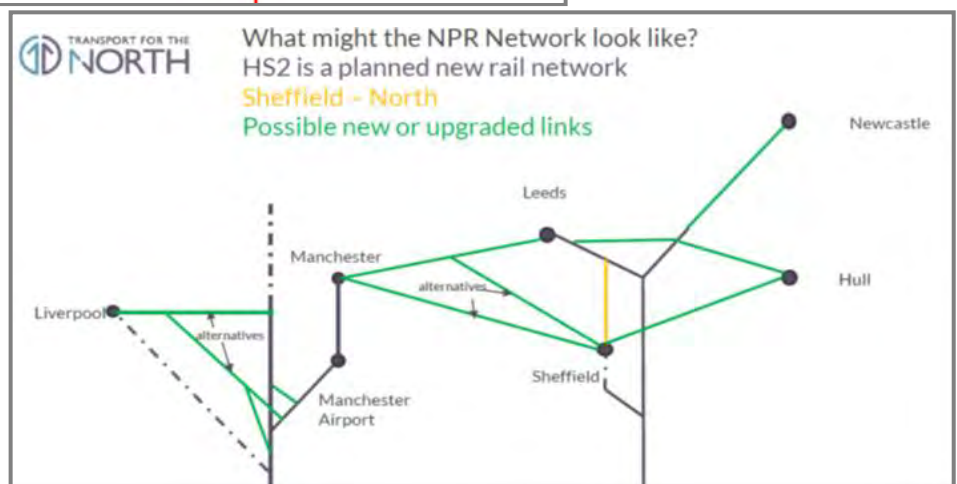


Figure 8 : Slides from Transport for the North Presentation, 21 February 2017

4. January 2018 Release of TfN *Strategic Transport Plan*

On 16 January 2018, Transport for the North (TfN) released its long-awaited *Strategic Transport Plan*. The key railway elements of the TfN strategy are summarised in Figure 9.

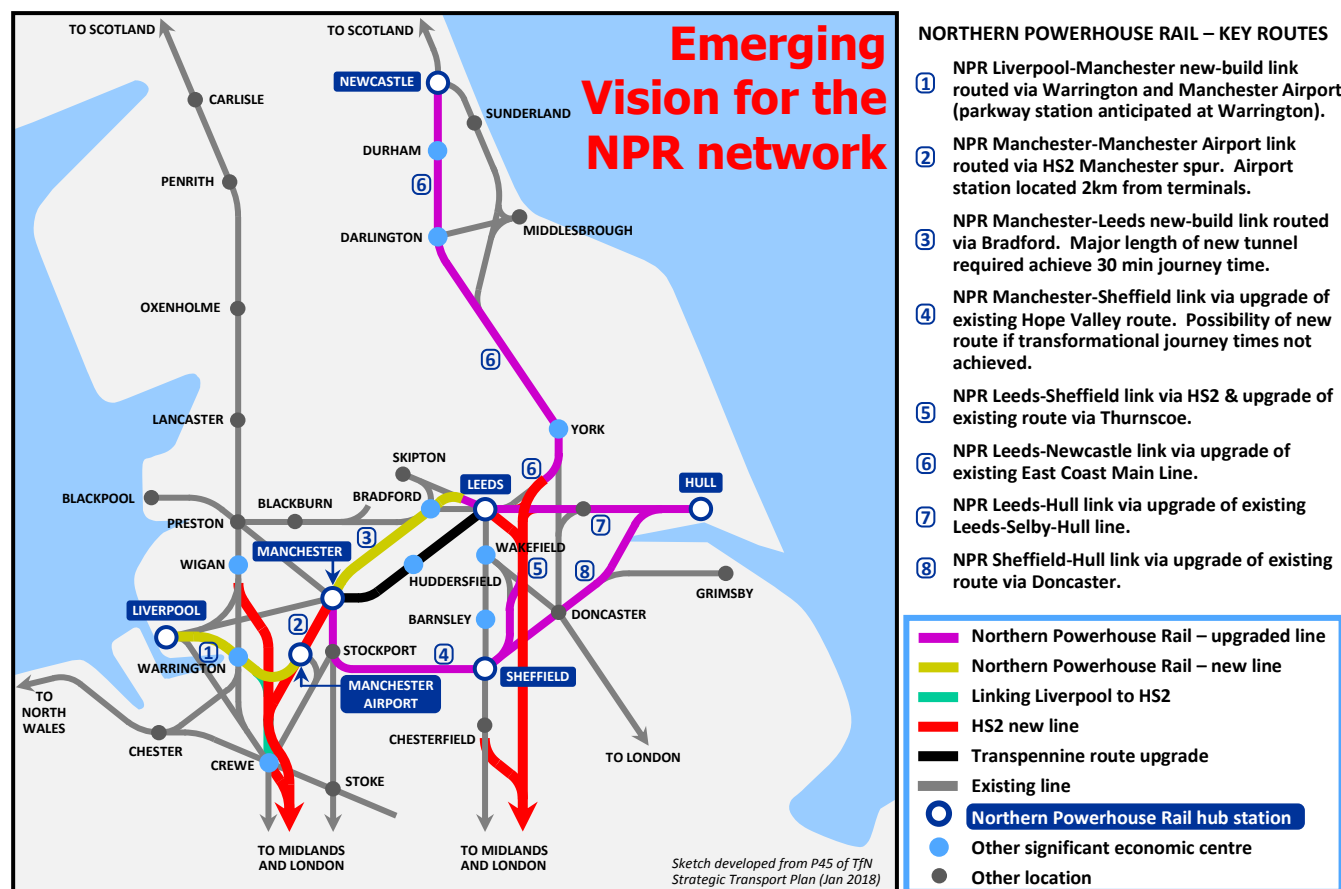


Figure 9 : 'Emerging Vision' for TfN Northern Powerhouse Rail Proposals

4.1. Initial Review of TfN *Strategic Transport Plan*

The 'Emerging Vision' for the Northern Powerhouse Rail network indicated in Figure 9 cannot be regarded as a complete scheme, but sufficient detail is provided¹¹ in the TfN documentation to allow the proposed routes to be modelled. From this modelling, several definitive conclusions can be drawn:

- The stated 28 minute journey time along the proposed new line between Liverpool and Manchester is greatly in excess of the specified journey time of 20 minutes, and scarcely superior to the existing direct journey time of 32 minutes. This deficiency can be attributed to circuitous routeing along the proposed HS2 Manchester Spur via Manchester Airport.
- Although the Liverpool-Manchester route is shown as passing through Warrington, this appears only to be possible with a parkway station located either north or south of the town. Such a station would contravene the fundamental 'One North' requirement for city centre stations.
- Any Sheffield to Liverpool or Manchester Airport service will need to reverse at the HS2 Manchester terminus, significantly adding to through journey times. The journey time from Sheffield to the Manchester Airport HS2 station, and by some as-yet-unspecified shuttle connection to the airport terminals, is likely to be of the order of 60 minutes – hugely in excess of the specified 30 minutes.

¹¹ P44, *Strategic Transport Plan*, Transport for the North, January 2018

- Contrary to earlier reported initiatives for an upgrade of the Transpennine Main Line, the TfN *Strategic Transport Plan* has instead proposed a new transpennine rail line, connecting Manchester and Leeds via Bradford. HSUK modelling – see Appendix E1 – indicates that this will require a new tunnel over 30km long – far longer than any existing tunnel on the UK rail network – to meet the 30 minute journey time target.
- There is no new-build option so far proposed for the Sheffield-Manchester route to match what is proposed for the Manchester-Leeds route. Instead, the aspiration remains to upgrade ***‘the corridor of the existing Hope Valley line’***, but no information is given as to how ***‘transformational journey times’*** will be realised. Reduction of journey times from the existing 48 minutes to the 30 minute target set by ‘One North’ seems improbable for a route on which most upgrade opportunities have already been exploited; the only option by which the target might be achieved would be another transpennine tunnel over 30km long (see Appendix E1).
- Despite the original ‘One North’ report effectively specifying¹² the Woodhead corridor as the route for a new transpennine railway, there is no reference whatsoever to Woodhead in the TfN *Strategic Transport Plan*.
- The proposed strategy for improvements between Leeds and Newcastle – again an already highly engineered route, with few if any remaining opportunities for significant upgrades – appears unable to achieve the specified 60 minute journey time.

There is therefore considerable prima-facie evidence that the ‘emerging vision’ for Northern Powerhouse Rail will fail to meet many aspects of the HS3 journey time specification originally established by ‘One North’. Any success that might be achieved (for instance on transpennine routes between Manchester and Leeds, or Manchester and Sheffield) will only be at the expense of unprecedented lengths of tunnel. These lengths of tunnel will of course carry associated implications not only for excessive project cost but also for excessive time to completion.

4.2. Omission of HS3 Specification for Improved Journey Times

With regard to the HS3 journey time specification – which has been included in all previous iterations of TfN documentation, as late as June 2017 – this specification is conspicuous by its absence in the current TfN *Strategic Transport Plan*. The TfN *Strategic Transport Plan* offers no explanation; but given the broad failure of the TfN proposals to meet this crucial specification, the onus must be upon Transport for the North to provide a credible narrative to account for its omission.

However, the TfN *Strategic Transport Plan* does offer two alternative criteria¹³ by which success in reducing journey times might be determined.

The following primary aim is stated: ***‘Increase the population within one hour of four of the largest cities from less than 10,000 today to 1.3 million, helping support a modal shift from road to rail’***.

A secondary aim is also stated: ***‘Change the way labour markets work... (so that) ...40% of businesses identified in the Northern Powerhouse Independent Economic Review as prime capabilities would be within 90 minutes rail travel of four or more of the North’s largest cities’***.

¹² P31, *One North : A Proposition for an Interconnected North*, ‘One North’, July 2014

¹³ P44, *Strategic Transport Plan*, Transport for the North, January 2018

4.3. Speed Ambitions of TfN *Strategic Transport Plan*

The TfN *Strategic Transport Plan* sets out an ambition¹⁴ to achieve average journey speeds as follows:

- 40MPH (64km/h) for local services;
- 60MPH (96km/h) for inter-urban services;
- 80MPH (128km/h) for long distance services.

It must be emphasised that speed is not an end in itself, but rather the means of achieving a desired journey time. Noting the average speeds implied by the 'One North' journey time targets (ranging from 94km/h to 151km/h, see Table 10), it is clear that these targets can only be met if TfN's ambitions for average speed are considerably increased.

	Intercity Journey	Existing Journey Time (mins)	Proposed Journey Time (mins)	Percentage Improvement	Straight Line Distance (km)	Average Speed (km/h)
Northern Powerhouse	Leeds-Manchester	49	30	39%	57	115
	Leeds-Sheffield	40	30	25%	47	94
	Sheffield-Manchester	48	30	37%	52	104
	Liverpool-Manchester	32	20	37%	50	151
	Leeds-Newcastle	82	60	27%	131	131
HS2	Leeds-London	131	81	38%	270	200
	Manchester-London	127	67	47%	260	232
	Birmingham-London	84	49	42%	161	197

Table 10 : Existing and Proposed Journey Times for NPR and HS2 (Repeat of Table 2)

The TfN *Strategic Transport Plan* also notes¹⁵ that new trains employed on Northern Powerhouse Rail services are likely to have a maximum speed capability of 125MPH (201km/h).

This is clearly at odds with the Government's ambition to operate HS2 at 360km/h, and to design its infrastructure for future 400km/h operation. The huge speed differentials between NPR trains running at 201km/h and HS2 trains running at 400km/h are certain to cause major operational conflicts, and therefore capacity problems, on routes where both NPR and HS2 services are planned to operate.

Such routes include Leeds to Sheffield and Liverpool to Manchester, but the greatest problems are anticipated on any new high speed line from Yorkshire to the North-East, with a route length of 118km from York to Newcastle. It would thus seem prudent for the trains employed on Northern Powerhouse Rail services to be designed to a common technical platform with those intended for HS2.

For the purposes of assessing the journey time potential of TfN's proposed new-build routes, it has been assumed that where curvature permits, new-build routes will operate at 230km/h, and rolling stock will be procured accordingly.

¹⁴ P51, *Strategic Transport Plan*, Transport for the North, January 2018

¹⁵ P51, *Strategic Transport Plan*, Transport for the North, January 2018

4.4. Dependency of NPR upon established HS2 proposals

There is also plentiful evidence in the TfN *Strategic Transport Plan* of the excessive dependency of Northern Powerhouse Rail upon the established HS2 proposals¹⁶. Whilst it is desirable that one project is integrated with another, the TfN report fails to recognise any possible danger in basing Northern Powerhouse Rail – whose core rationale is the transformation of transpennine connectivity – upon the northern sections of HS2, both in Yorkshire and Greater Manchester.

As noted in Item 3.6.2, these routes were designed with the primary aim of minimising north-south journey times, and with no thought for enhanced transpennine connectivity¹⁷. It would therefore seem highly unlikely that TfN's predication of its transpennine routes upon HS2 could deliver optimum outcomes for transpennine connectivity.

4.5. TfN Claim for 'maximised economic outcomes for the UK'

Overall, there is little evidence that the TfN *Strategic Transport Plan* has been developed with any holistic consideration of the many factors that must come together to deliver an optimised railway network. However, it must be emphasised that this is largely a qualitative judgment. It is only possible to make a more rational and more quantitative judgment through:

- Assessing Northern Powerhouse Rail against a fully structured Requirements Statement which embodies the ideal of an efficiently functioning regional (and national) rail network.
- Comparing its performance with an alternative proposal such as High Speed UK, in order to test the degree to which NPR has been optimised as a regional (and national) rail network.

It should particularly be noted that the TfN *Strategic Transport Plan* has made a clear claim¹⁸ for the overall optimisation of the Northern Powerhouse Rail proposals: ***'Together with the existing mainline route network, HS2 and Northern Powerhouse Rail can create a flexible set of services to maximise the economic outcomes for the UK'***.

These ***'maximised economic outcomes'*** can of course only come about if two preconditions are met. Firstly, HS2 and Northern Powerhouse Rail must be fully integrated to form an efficient network capable of transforming the connectivity of the North, and indeed the wider UK. Secondly, HS2 and Northern Powerhouse Rail must together form a railway system that outperforms any rival option.

However, the TfN *Strategic Transport Plan* offers no evidence to justify either:

- the claim of ***'maximised economic outcomes'***; or
- the improved network performance and the ***'flexible set of services'*** necessary to bring about these claimed gains.

¹⁶ P35, P44-P46, *Strategic Transport Plan*, Transport for the North, January 2018. For further details of the Government's HS2 proposals, see Appendix A.

¹⁷ The design of HS2's routes to exclusively north-south priorities is demonstrated unambiguously in the Freedom of Information response ref FOI18-1944 by HS2 Ltd, dated 21 February 2018. See Section 3.6 and Figure 7.

¹⁸ P46, *Strategic Transport Plan*, Transport for the North, January 2018

5. High Speed UK 'Exemplar Alternative'

To verify that the TfN proposals are properly optimised to deliver the greatest benefit either for the Northern Powerhouse region or for the UK, this report will where appropriate make structured comparisons with the 'exemplar alternative' of the High Speed UK (HSUK) scheme.

High Speed UK is planned and designed as a national intercity network that directly addresses the core HS2 remit for **'hugely enhanced capacity and connectivity'**¹⁹ between the UK's major conurbations. Central to the HSUK scheme is a new transpennine high speed line routed via the Woodhead corridor, which will provide direct high speed links from Manchester to Sheffield **and** Leeds. This appears to align very closely with the 'One North' aspiration for a new 'transpennine corridor', as set out in Sections 3.2 and 3.3 of this report.

Although HSUK's greatest advantage lies in its optimised performance as a national network, it can also be considered as a set of 'modular' intercity links which can be assembled in many different sequences. Unlike HS2 (and therefore also Northern Powerhouse Rail), which can only logically be built in a northward progression from London, it would be eminently feasible to commence construction of HSUK in the North, in advance of its southern sections.

The HSUK core network in the Northern Powerhouse region is shown in Figure 11 below, and further details are provided in Appendix B.

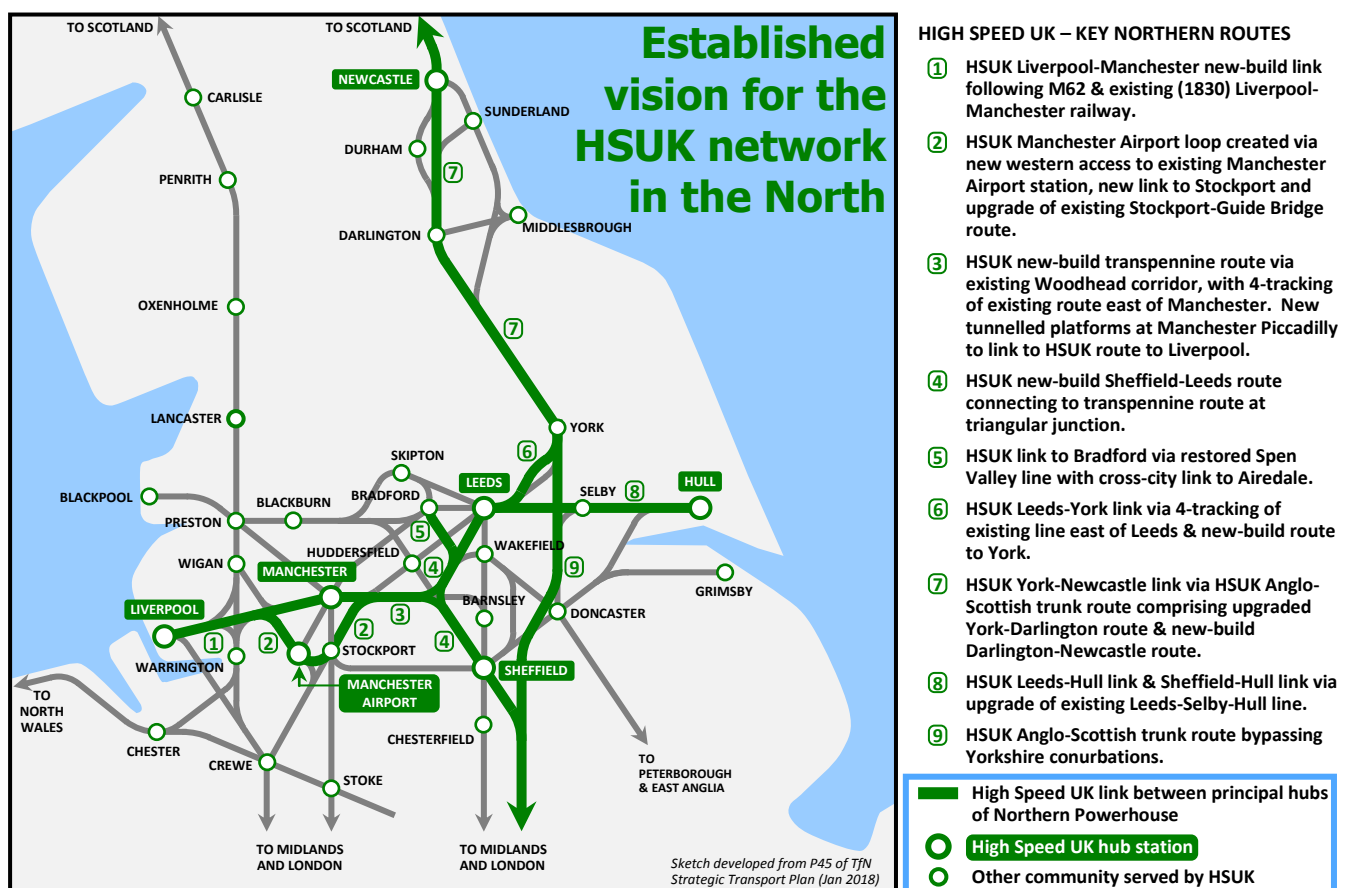


Figure 11 : 'Established Vision' for HSUK links between principal Northern Powerhouse cities

¹⁹ On 30th November 2015, HS2 Ltd Technical Director Andrew McNaughton informed the HS2 Select Committee that: "The aim of the HS2 project is to deliver hugely enhanced capacity and connectivity between our major conurbations."

6. Assessment Criteria for Northern Powerhouse Rail

Whilst the primary aim of this report is to develop a Requirements Statement, or specification, by which the performance of the TfN *Strategic Transport Plan* for Northern Powerhouse Rail can be judged, it must be acknowledged that there are competing considerations of project cost and timescale. In making a structured judgment between rival projects, all aspects of specification, cost and timescale must be considered.

The assessment criteria set out in the following sections 6.1 – 6.4 will be applied both to the Northern Powerhouse Rail scheme (as set out in the TfN *Strategic Transport Plan*) and to the High Speed UK 'exemplar alternative'.

6.1. Development of Requirements Statement for Northern Powerhouse Rail

A Requirements Statement is essential to define the criteria to which the railway network of the Northern Powerhouse should be developed. None of these requirements should be viewed as 'absolutes'; but success in meeting as many as possible of these requirements would indicate the scheme best able to satisfy the political and public need for a well-connected and prosperous Northern Powerhouse.

This Requirements Statement is summarised below, and is set out in full in Appendix D.

6.1.1. Adherence to HS3 Journey Time Specification

The Northern Powerhouse Rail scheme should achieve the reduced journey times detailed in the HS3 Specification.

6.1.2. Increased Capacity for Enhanced Services

The Northern Powerhouse Rail scheme should provide the increased network capacity to accommodate not only Northern Powerhouse Rail intercity (and city to airport) services operating at the specified frequency, but also step-change increases in local passenger services and freight services.

6.1.3. NPR Station Location and Configuration

Northern Powerhouse Rail stations should generally be located in city centres, fully integrated with local transport networks and with HS2. They should provide the extra capacity to accommodate both the increased intercity frequencies stipulated by the HS3 Specification and the required step-change increase in local services. As a broad guideline, there should be an aspiration for local services to be doubled in frequency.

6.1.4. Longer Distance NPR Services

The Northern Powerhouse Rail scheme should enable longer-distance intercity links (e.g. Liverpool to Hull or Newcastle) that are not covered explicitly in the HS3 Specification.

6.1.5. Northern Powerhouse Network Connectivity

The enhanced network created by the Northern Powerhouse Rail scheme should extend to cover all second-tier centres (e.g. Bradford, York, Warrington, Preston, all in the 100,000 – 500,000 population range), and also to less populous / more peripheral communities, that are not addressed explicitly in the HS3 Specification.

6.1.6. Integration of NPR with HS2

Northern Powerhouse Rail and HS2 services should be integrated to ensure seamless links to neighbouring cities outside the Northern Powerhouse region e.g. Nottingham, Derby, Leicester, Stoke, Edinburgh and Glasgow.

6.1.7. NPR Vision for Railfreight

The Northern Powerhouse Rail scheme must offer a holistic vision for transformed railfreight links across the North. This should address all the deficiencies of the present network which prevent efficient railfreight services.

6.1.8. Minimised Dependency on HS2

The Northern Powerhouse Rail scheme and local elements of HS2 should be fully integrated to optimise their overall performance in connecting Northern communities. The NPR scheme should be capable of implementation in advance of HS2 works in other parts of the country.

6.1.9. A Complete Vision for Northern Powerhouse Rail

The Northern Powerhouse Rail scheme must offer a complete vision for achieving all the railway requirements of the Northern Powerhouse, as detailed in this Requirements Statement.

6.1.10. Technical Excellence for the Northern Powerhouse

It is naturally assumed that the Northern Powerhouse Rail scheme that is finally adopted will be the option best able to deliver the optimised regional (and national) railway network as defined in this Requirements Statement, and thus maximise the opportunities for sustainable economic growth in the Northern Powerhouse Region.

6.2. TfN '60-minute Criterion'

Whilst Transport for the North's *Strategic Transport Plan* appears to have abandoned the HS3 Specification for reduced intercity (and city to airport) journey times, it has introduced²⁰ a new criterion, to maximise the population within 60 minutes' travel time of the '4 largest cities' of the Northern Powerhouse. These 4 cities are presumed to be Liverpool, Manchester, Leeds and Sheffield, respectively at the hearts of the Merseyside, Greater Manchester, West and South Yorkshire conurbations which together comprise over 7 million population.

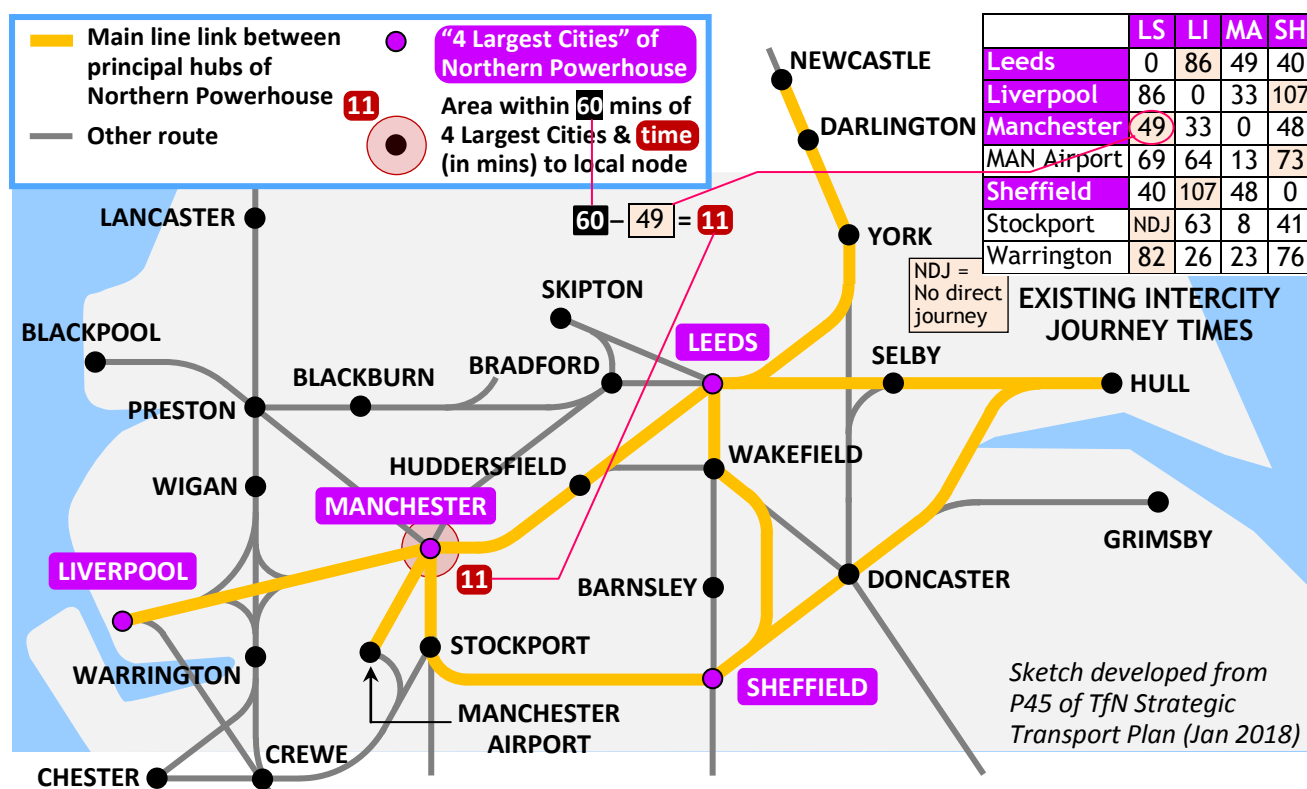


Figure 12 : Areas currently within 60 minutes of 4 largest Northern Powerhouse cities

The TfN *Strategic Transport Plan* notes that only 10,000 people currently live within 60 minutes of all 4 cities. Given the central position of Manchester relative to the other 3 cities, and given the existing intercity journey times, all over 30 minutes, it is clear that these 10,000 people meeting the '60-minute Criterion' must reside within a relatively small area in central Manchester. As shown in Figure 12, the longest journey time of 49 minutes (to Leeds) determines that only the population located within 11 minutes of Manchester Piccadilly can be within 60 minutes ($=49+11$) of the 4 largest cities.

Noting the secondary TfN ambition for 40% of 'prime capability' businesses to be located within 90 minutes of the 4 largest cities, insufficient information currently exists as to what constitutes a 'prime capability' business to allow a precise assessment in this regard. However, it seems highly likely that the scheme that succeeds best in the '60-minute Criterion' discussed above will also succeed best in linking the greatest proportion of 'prime capability' businesses to the principal cities of the Northern Powerhouse.

²⁰ P44, *Strategic Transport Plan*, Transport for the North, January 2018

6.3. Assessment of Cost of Northern Powerhouse Rail Links

With the broad routing strategy of Northern Powerhouse Rail defined in the TfN *Strategic Transport Plan*, it is possible to make projections of the works required to meet the journey time targets of the HS3 Specification. The costings for these works can then be extrapolated from the 'baseline' costing of £55.6 billion for the defined elements of the HS2 'Y-network', as shown in Figure A1.

The costings developed in this report for Northern Powerhouse Rail will include both the elements defined in the TfN *Strategic Transport Plan*, and the elements of HS2's northern routes on which the TfN proposals are based i.e. routes accessing Liverpool, Manchester Airport, Manchester, Bradford, Leeds and Sheffield. Costs are then developed for the residual elements of HS2 in the Midlands and the South, and for projected elements of HS2 extending north to Newcastle, Edinburgh and Glasgow to provide a total cost for the Government's UK high speed rail project i.e. both HS2 and Northern Powerhouse Rail.

The detailed route design undertaken for High Speed UK – which has included the preparation of horizontal and vertical railway alignments – has allowed a parallel costing exercise to be undertaken for:

- All HSUK elements necessary to interlink the principal centres of the Northern Powerhouse within Lancashire and Yorkshire i.e. Liverpool, Manchester, Manchester Airport, Sheffield and Leeds, plus Bradford.
- All HSUK elements necessary for southward connections to the same primary cities served by HS2 i.e. Nottingham, Birmingham and London.
- All HSUK elements necessary for northward connections to Newcastle, Edinburgh and Glasgow.

6.4. Assessment of Timescale

At this stage, it is not possible to make a detailed assessment of the timescale necessary to complete the works necessary for any NPR scheme for improved rail links in the Northern Powerhouse.

Notwithstanding this uncertainty, it can still be definitively stated that a self-standing project requiring shorter lengths of new route and tunnel will take less time to complete than a project which is dependent upon another, and which requires greater length of new route and tunnel.

6.5. The 'Project Manager's Triangle'

The need to complete a project to a restricted budget and timescale may prevent the achievement of all aspects of the specification, and political and financial judgments may dictate a reduced specification to enable the project to be completed as soon as possible, to the budget that is currently available. This is represented as Option A in the 'Project Manager's Triangle' set out in Figure 13.

Alternatively, a project may carry such prestige that completion to the highest specification is paramount, and timescale and budget overruns can be tolerated. This is represented as Option B.

In the example set out in Figure 13, neither triangle representing either Option A or Option B fully overlaps the other, and hence it is not possible to make a simple engineering determination of which option is superior. Instead, it is probable that financial and political externalities, rather than the quality of the engineering design, have determined the different performances.

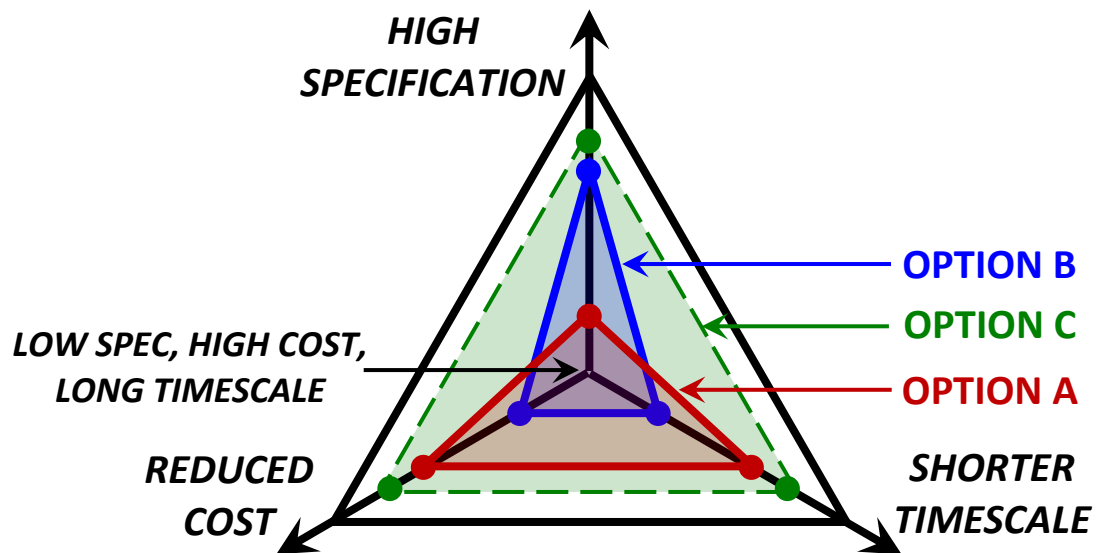


Figure 13 : The 'Project Manager's Triangle'

However, if a third Option C were to emerge, that offered higher specification, shorter timescale and lower cost than either Option A or B (and thus its triangle would fully overlap the others, as shown), the difference in performance could reasonably be ascribed to simpler questions of superior design and more appropriate specification.

7. Assessment of TfN *Strategic Transport Plan*

The TfN *Strategic Transport Plan* for Northern Powerhouse Rail has been assessed against the High Speed UK 'exemplar alternative' on 4 key aspects of project performance:

- Performance against the Requirements Statement developed by HSUK (see Section 7.1).
- Performance against TfN's own '60-minute Criterion' (see Section 7.2).
- Project cost, both for Northern Powerhouse links and nationally (see Section 7.3).
- Project timescale (see Section 7.4).

As noted previously, these comparisons are informed by:

- Detailed route design undertaken by HSUK in the development of the HSUK scheme.
- Publicly available information on HS2 Ltd's proposals for the HS2 'Y-network'.
- TfN's own proposals as published in the January 2018 *Strategic Transport Plan*.
- Calculation of journey times for HSUK routes, validated against published timings for HS2.
- Estimation of construction costs for HSUK, validated against published costings for HS2.

The information listed above has allowed the formulation of putative routes for TfN's proposed Northern Powerhouse links, the calculation of journey times and the estimation of construction costs.

Further information on the methodologies adopted by HSUK is given in *HS2 – High Speed to Nowhere*, available on www.highspeeduk.co.uk.

7.1. Northern Powerhouse Rail : Performance against Requirements Statement

The performance of TfN's Northern Powerhouse Rail proposals against the Requirements Statement set out in Section 6 is described in the following items:

- Adherence to 'One North' Journey Time Targets (7.1.1)
- Increased Capacity for Enhanced Northern Powerhouse Rail Services (7.1.2)
- Northern Powerhouse Rail Station Location and Configuration (7.1.3)
- Longer Distance Northern Powerhouse Rail Services (7.1.4)
- Northern Powerhouse Network Connectivity (7.1.5)
- Integration of Northern Powerhouse Rail with HS2 (7.1.6)
- A Vision for Northern Powerhouse Railfreight (7.1.7)
- Minimised Dependency upon HS2 (7.1.8)
- A Complete Vision for Northern Powerhouse Rail (7.1.9)

This Requirements Statement is set out in full in Appendix D.

7.1.1. Adherence to 'One North' Journey Time Targets

The performance of TfN's Northern Powerhouse Rail proposals and the HSUK scheme in meeting the journey time targets of the 'HS3 Specification', originally established by 'One North' in 2014, is set out in Table 14 below. This demonstrates the near-complete failure of TfN's proposals to meet these journey time targets, and also the comprehensive superiority of the HSUK scheme.

Journey between Northern Powerhouse cities	Existing journey time (mins)	Specified journey time (mins)	NPR journey time (mins)	HSUK journey time (mins)	Winner?? NPR or HSUK??
Liverpool - Manchester	32	20	28	19 [#]	HSUK
Manchester - Sheffield	48	30	40	23	HSUK
Manchester - Leeds	49	30	30	26	HSUK
Sheffield - Leeds	40	30	28	19	HSUK
Manchester - MAN	13	10	13	13	—
Leeds - MAN	62	40	47	37	HSUK
Sheffield - MAN	73	30	60	34	HSUK
Liverpool - MAN	65	30	28	26	HSUK
Leeds - Newcastle	87	60	70	51 [#]	HSUK
Leeds - Hull	55	45	??	??	??
Sheffield - Hull	86	60	??	??	??

Journey time meeting HS3 Specification

Journey time failing to meet HS3 Specification

MAN = Manchester Airport
[#] Timings increase to 21 min (LI-MA) & 60min (LS-NE) at 230km/h maximum speed

Table 14 : NPR & HSUK Performance in meeting 'One North' Journey Time targets

General notes:

- All journey times include a standard 'dwell time' allowance of 2 minutes at through stations.
- NPR journey times via Manchester Piccadilly (i.e. Sheffield to Manchester Airport and to Liverpool) are enhanced by 3 minutes for longer standing time in terminus platforms.
- NPR Journey times to Manchester Airport include 8 minute allowance for transfer from proposed 'Manchester Airport' station on the HS2 Manchester spur to the existing Manchester Airport station, located in a centroidal position between all 3 airport terminals.
- Neither NPR nor HSUK are capable of reducing existing journey times from Manchester to Manchester Airport, therefore the existing journey time is quoted.
- Neither TfN nor HSUK have advanced detailed proposals for routes to Hull.

NPR and HSUK routes are shown in Figures 15 and 16. For further information, refer to Appendix E1.

The following summarised commentary is based upon detailed analysis of TfN's proposed routes, to determine whether they are capable of meeting the HS3 Specification for reduced intercity journey times. In the assessment of on-line upgrades, it has been assumed that line speeds can be increased to the maximum permitted by the track geometry. It is likely however that many of the routes have already been upgraded, but to a lesser speed dictated by considerations of shared use by freight and other traffic, and few if any further gains are achievable.

Liverpool – Manchester : 20 minute journey time required by HS3 Specification

NPR	28	HSUK analysis confirms the 28 minute Liverpool-Manchester journey time claimed by TfN. This journey time includes a stop at Manchester Airport but does not include any Warrington stop, presumed to be at a parkway station located either north or south of the town. TfN's failure to meet the specified 20 minute journey time is directly attributable to the proposed circuitous routing via Manchester Airport.
HSUK	19	HSUK only beats the HS3 specification by adopting a direct route, following the M62 and the existing Liverpool-Manchester 'Chat Moss' line, with no intermediate stops. Manchester Airport and Warrington (Bank Quay) are served by other routes.

Manchester – Sheffield : 30 minute journey time required by HS3 Specification

NPR	40	HSUK analysis shows that a 40 minute journey time is the fastest possible with an on-line upgrade of the existing Hope Valley route via Stockport – but probably not achievable given the needs of freight traffic. To achieve the specified 30 minute timing will require a new tunnel approximately 33km long between New Mills and Dore.
HSUK	23	HSUK's new transpennine high speed line via Woodhead (with 4-tracking of existing route from central Manchester to Hattersley), connecting to a Leeds-Sheffield (Victoria) route near Penistone, easily beats the HS3 Specification.

Manchester – Leeds : 30 minute journey time required by HS3 Specification

NPR	30	HSUK analysis indicates that a Manchester-Leeds route via Bradford will require a new tunnel approximately 33km long from Littleborough to Calverley in the Aire Valley, plus 4-tracking of existing routes from Manchester to Littleborough and from Calverley to Leeds, to achieve the specified 30 minute journey time. It is believed that this route was only selected after the works required for a 30 minute journey time via the existing 'Diggle' route – an 'upgrade' comprising around 25km of new tunnel plus 4-tracking of remaining route sections via Huddersfield – were deemed impracticable.
HSUK	26	HSUK's new transpennine high speed line via Woodhead (with 4-tracking of existing route from central Manchester to Hattersley), connecting to a Sheffield (Victoria)-Leeds route near Penistone, easily beats the HS3 Specification.

Sheffield – Leeds : 30 minute journey time required by HS3 Specification

NPR	28	HSUK analysis confirms that with the existing route from Sheffield to Thurnscoe upgraded to 4 tracks, and with a connection to HS2 at Clayton, the specified 30 minute journey time can be achieved. 4-tracking is necessary to separate high speed services from local services, and thus maintain service levels to intermediate stations.
HSUK	19	HSUK's new Sheffield-Leeds high speed line, running to the west of Barnsley and Wakefield to connect to the HSUK transpennine route near Penistone, easily beats the HS3 Specification.

Leeds – Newcastle : 60 minute journey time required by HS3 Specification

NPR	70	HSUK analysis demonstrates that a 70 minute journey time is the best achievable with an upgraded/new route from Leeds to York, and an on-line upgrade of the existing York-Newcastle East Coast Main Line. To achieve the specified 60 minute journey time will require a new high speed route from Darlington to Newcastle to bypass the existing highly-curved route via Durham (where no upgrades are deemed practicable).
HSUK	51	HSUK's upgraded/new route from Leeds to York, connecting to HSUK Anglo-Scottish spine route north of York, easily beats the HS3 Specification even with intermediate stops at York and Darlington. Timing increases to 60 minutes at 230km/h max speed.

The journey times set out in Table 14 are based upon the routes depicted in Figures 15 and 16.

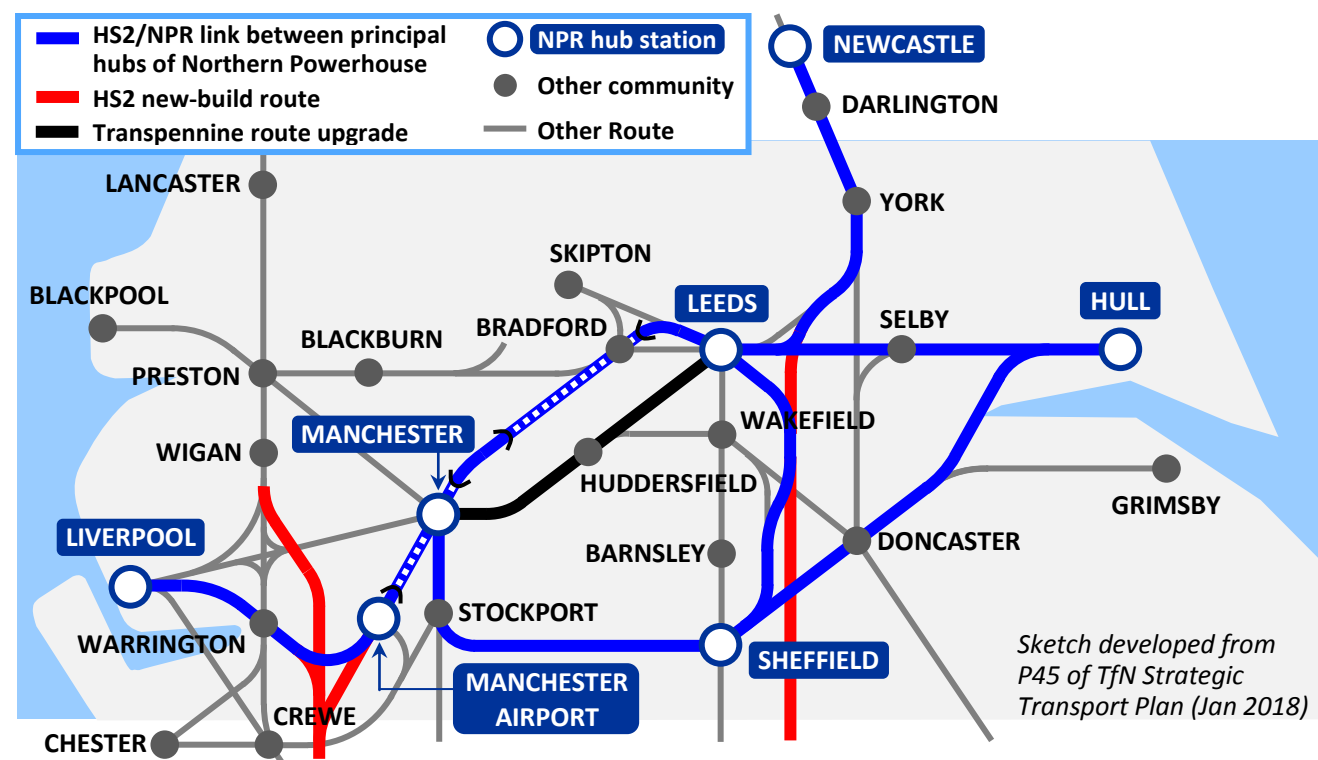


Figure 15 : NPR Routes Analysed to Determine Intercity Journey Times

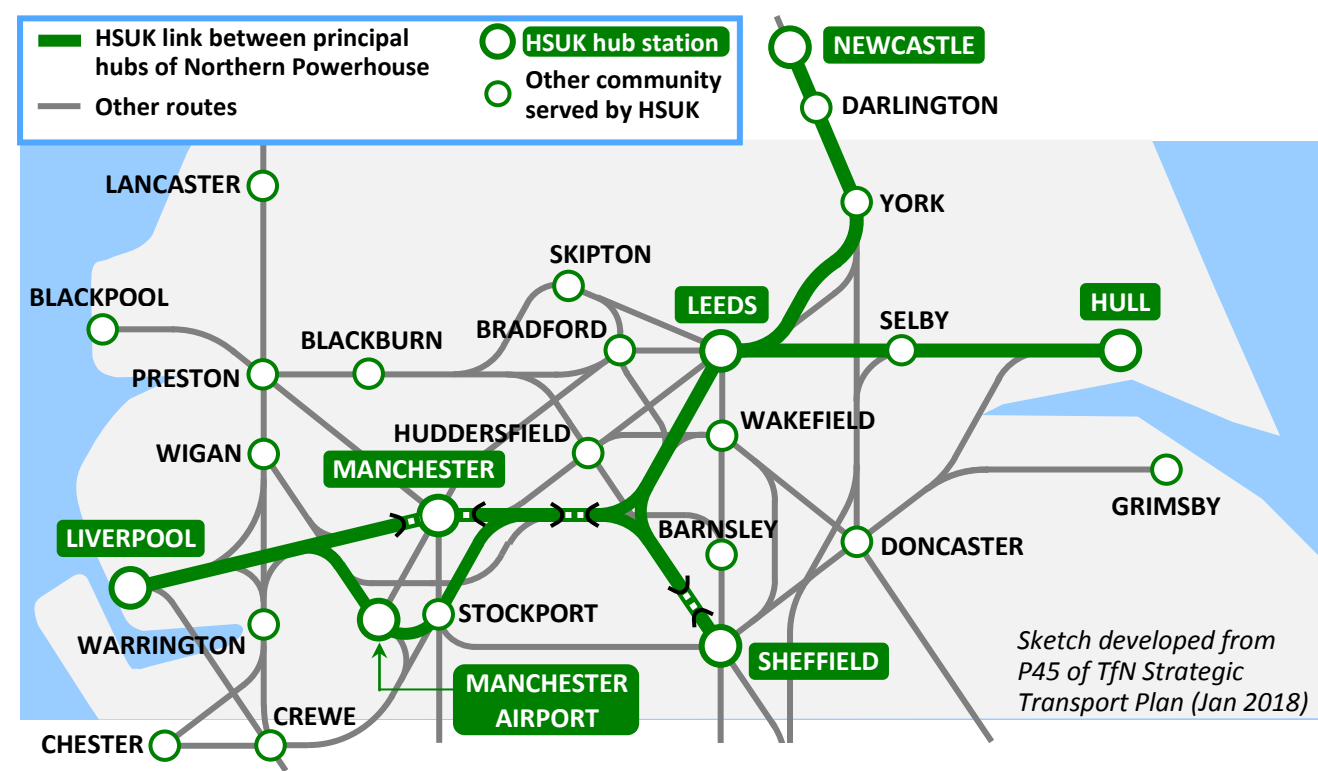


Figure 16 : HSUK Routes Analysed to Determine Intercity Journey Times

7.1.2. Increased Capacity for Enhanced Northern Powerhouse Rail Services

The 'One North' targets for radically reduced intercity journey times and the requirement for transformed freight services cannot be met through the TfN strategy, which is mostly focussed upon upgrading of existing routes. Such a strategy will not provide the new tracks that are necessary to segregate high speed intercity traffic from local passenger traffic and from freight traffic, and thereby achieve the required step-change increase in capacity on all primary routes.

Only High Speed UK has the integrated strategy for complementary development of:

- new-build routes;
- upgrading of existing 2-track routes to 4 tracks; and
- restoration of abandoned routes.

These 3 strands of network development will together provide 2 new tracks along all the congested primary routes between the principal centres of the Northern Powerhouse (note that for routes to Hull, HSUK and TfN are still developing definitive proposals).

Primary Route between Northern Powerhouse cities	Northern Powerhouse Rail		High Speed UK	
	2 New Tracks provided?		2 New Tracks provided?	
Liverpool - Manchester	Yes	Except for approaches to Liverpool Lime Street	Yes	Except for approaches to Liverpool Lime Street
Manchester - Sheffield	No	Under current upgrade plans, most of route will remain a 2-track railway	Yes	HSUK route from Leeds to Sheffield meets transpennine route via Woodhead to Manchester to form '3-pointed star' of high speed lines, with 2 new tracks for full length.
Manchester - Leeds	Yes	4-tracking assumed along existing Aire Valley and Manchester-Rochdale routes	Yes	(Existing Woodhead route also restored to provide 2 new tracks for freight.)
Sheffield - Leeds	??	Not certain whether upgrade plans north of Sheffield include full-length 4-tracking	Yes	2 new tracks planned for full length between Leeds and Newcastle
Leeds - Newcastle	No	Upgrade plans assumed not to include extra tracks/new routes from York to Newcastle	Yes	

Table 17 : NPR & HSUK Provision of New Tracks on Principal Intercity Routes

Table 17 charts the performance of Northern Powerhouse Rail and HSUK in meeting the 'One North' aspiration for new routes, or new tracks, to be provided on all principal intercity corridors. Without these new tracks, it would appear impossible to provide the extra capacity necessary for enhanced intercity and local rail services in the Northern Powerhouse region.

It must of course be emphasised that route capacity is only one aspect of the wider requirement for increased network capacity. It is equally important to increase capacity at the key network hubs, in particular Manchester, Sheffield and Leeds.

For further information refer to Appendix E2, and to the route diagrams (Figures A – E and W – X) and associated tables in Appendix E1.

7.1.3. Northern Powerhouse Rail Station Location and Configuration

The TfN Strategic Transport Plan offers no insight as to how the main line stations in the principal cities of the Northern Powerhouse can be developed to:

- a) address existing congestion problems; and
- b) provide the new capacity necessary to accommodate both the increased intercity frequencies stipulated by the HS3 Specification, and a similar step-change increase in local services.

This demands efficient 'through' stations – but instead, the TfN strategy endorses the misguided HS2 proposals for new terminus stations in both Leeds and Manchester. With TfN strategy based upon these inadequate proposals, it appears impossible to achieve the broad aspiration for a doubling of capacity to achieve a doubling in local service frequency and thus meet wider aspirations for improved connectivity.

Current TfN plans for principal stations are as follows:

- **Manchester Piccadilly** – new underground platforms on north-south tunnel linking NPR Liverpool-Manchester high speed line to NPR transpennine high speed line via Bradford. Sheffield-Liverpool flows routed via proposed HS2 terminus at Piccadilly. (Option for new surface terminus handling all NPR flows discounted due to high frequency train movements causing conflicts and congestion, and the certainty of increased journey times).
- **Manchester Airport** – proposed station on HS2 Manchester spur linked to airport terminals via new dedicated shuttle (presumed necessary, but not yet specified by TfN).
- **Sheffield Midland** – existing Sheffield Midland station developed as terminal for both HS2 and Northern Powerhouse Rail services. The major physical expansion required to accommodate the planned extra services appears unachievable without huge disruption.
- **Leeds** – major expansion seems essential to accommodate planned increase in NPR services, yet no space appears to exist, and no expansion is allowed for in the Leeds Station Masterplan.

HSUK's proposals for the development of Manchester Piccadilly, Manchester Airport, Sheffield Victoria and Leeds stations will transform capacity and connectivity across the North.

- **Manchester Piccadilly** – new underground platforms on east-west tunnel linking HSUK Liverpool-Manchester high speed line to HSUK transpennine high speed line via Woodhead. Connections to Stockport and Bolton lines offer major benefits for local services.
- **Manchester Airport** – existing terminus station transformed into through station with new tunnel to the west to create full 'South Manchester Loop' via Stockport and Altrincham. Capacity will be massively increased, allowing direct services to all major Northern communities.
- **Sheffield Victoria** – new station built on site of former Sheffield Victoria, to cater primarily for intercity traffic. New station will include interchange platforms on approaches to Sheffield Midland and new tram services to maximise integration with local rail and other public transport.
- **Leeds** – capacity of approach routes doubled by restoration of Farnley Viaduct to south-west, and 4-tracking to east. New Stourton-Neville Hill link proposed to enable through running (rather than termination) of many local services, part of a wider plan to double frequency of local services without any requirement for major expansion of the station.

Further details of proposed HSUK and HS2/NPR station developments are given in Appendix E3.

7.1.4. Longer Distance Northern Powerhouse Rail Services

Under TfN's proposals set out in the January 2018 *Strategic Transport Plan*, it appears possible and viable to operate direct services between all the principal centres of the Northern Powerhouse Rail, with the single exception of Hull to Newcastle. However, the performance of these links will be compromised by:

- The long transfer from the HS2 Manchester Airport station to the airport terminals.
- Sheffield-Liverpool services needing to reverse at Manchester Piccadilly terminus station.

It is presumed that TfN would favour the scheme for a north-south tunnel with underground platforms at Manchester Piccadilly, rather than the suggested alternative of a surface terminus station catering for all Northern Powerhouse Rail services to Manchester. If this latter option were to be chosen, then all trans-pennine services to Manchester Airport and Liverpool would be compelled to turn back at this terminus. As noted previously, this terminus option has been discounted due to its simple impracticality.

								Shuttle Link at MAN Airport
								MP Via Manchester Picc terminus
Hull	HU							NPR Direct Intercity Link
Leeds		LS						O No NPR Direct Link
Liverpool			LI					
Manchester				MA				
MAN Airport					O	MAN		
Newcastle	O						NE	
Sheffield			MP		MP		SH	
	HU	LS	LI	MA	MAN	NE	SH	

Figure 18 : NPR Direct Intercity Connectivity between Northern Powerhouse Cities

With both Manchester Piccadilly and Manchester Airport stations developed to accommodate through services, connecting Northern Powerhouse communities to the east and west, HSUK is capable of offering far superior (and significantly faster) long distance services across the entire Northern Powerhouse region. All the connections noted in Figure 19 are high speed services that are detailed in the HSUK timetable, and supported by the comprehensive route design undertaken for the HSUK project. (As with NPR, HSUK will not offer a direct Hull-Newcastle service, and there is no proposed HSUK service between Manchester and Manchester Airport faster than the current service).

Hull	HU							HSUK Direct Intercity Link
Leeds		LS						O No HSUK Direct Link
Liverpool			LI					
Manchester				MA				
MAN Airport					O	MAN		
Newcastle	O						NE	
Sheffield							SH	
	HU	LS	LI	MA	MAN	NE	SH	

Figure 19 : HSUK Direct Intercity Connectivity between Northern Powerhouse Cities

For further information, including a comprehensive comparison of journey times, see Appendix E4.

7.1.5. Northern Powerhouse Network Connectivity

The connectivity of TfN's proposed Northern Powerhouse Rail network has been assessed by considering 17 key centres, and charting the number of possible direct (i.e. no change of trains) journeys between these 17 centres. Even with a journey to the remote HS2 Manchester Airport station accepted as a direct link to the airport, NPR and HS2 succeed in providing only 53 direct links out of a possible 136.

[illegible]

Note: With no credible proposals for a central Warrington station on the proposed Liverpool-Manchester line (instead, a peripheral parkway has been assumed), Warrington has been deemed **'not served by Northern Powerhouse Rail'**.

**Figure 20 :
Direct Intercity Connectivity
between principal centres
of Northern Powerhouse,
with NPR and HS2 in place.**

By contrast, HSUK will provide 103 direct links out of a possible 136. This superior performance is directly attributable to HSUK's design as a fully integrated intercity network, designed to serve all centres served by the present intercity network and also to achieve optimal interregional connectivity.

[illegible]

*For further information re
proposed HSUK services, see
Appendix E5*

**Figure 21 :
Direct Intercity Connectivity
between principal centres
of Northern Powerhouse,
with HSUK in place.**

Figures 20 and 21 also chart the connections that are made possible by the proposed NPR transpennine tunnel via Bradford, and by the proposed HSUK transpennine crossing via Woodhead. Whereas HSUK's Woodhead route offers 39 transpennine connections, the NPR Bradford route offers only 23.

7.1.6. Integration of NPR with HS2

Whilst NPR will connect to HS2 services at all major cities, HS2's critical failings as a national intercity network mean that it cannot offer effective links from Northern Powerhouse cities to its closest neighbours ie Glasgow, Edinburgh, Derby, Leicester, Nottingham and Stoke. Rather than offer improved intercity services to these neighbouring communities, the intervention of HS2 will instead result in services generally being made worse – either through reduced frequency, increased journey time or the introduction of new changes of trains.

These service reductions – all documented in HS2 Ltd's own reports – are directly attributable to HS2 Ltd's irresponsible policy of developing services aimed at 'creaming off' lucrative flows between primary cities (e.g. Manchester or Sheffield to London) whilst failing to serve intermediate cities such as Stoke, Derby and Leicester. In a similar fashion, HS2 Ltd's proposed diversion of Edinburgh-London services from East Coast to West Coast corridors, and truncation of CrossCountry services, mean that services from Yorkshire and North-Eastern cities to Edinburgh and Glasgow will also be greatly degraded.

	Interregional Links Provided by											
	High Speed 2						High Speed UK					
	HS2 direct intercity link						HSUK direct intercity link					
	X						W					
	Journey made worse by HS2						HSUK direct link via Woodhead					
Bradford						X						W
Chester											W	
Crewe												
Darlington	X	X	X			X						W
Doncaster	X	X	X	X		X						
Huddersfield	X					X						
Hull	X	X	X	X		X						
Leeds	X	X	X			X						W
Liverpool				X			W	W		W	W	
Manchester			X	X			W	W	W	W	W	
MAN Airport			X	X							W	
Newcastle	X	X	X			X						W
Preston									W	W		
Sheffield	X	X	X	X		X						W
Stockport			X	X		X	W	W		W	W	
Warrington	X	X	X	X							W	
York	X	X	X			X						W
	Edinburgh	Glasgow	Derby	Leicester	Nottingham	Stoke	Edinburgh	Glasgow	Derby	Leicester	Nottingham	Stoke

Information on reduced main line intercity services resulting from the intervention of HS2 is given in HS2 Regional Economic Impacts, HS2 Ltd, September 2013. For further details see Appendix E6.

Information on proposed HSUK high speed intercity services is given in HS2 – High Speed to Nowhere, Colin Elliff, 2017, available on www.highspeeduk.co.uk See also Appendix E6.

**Figure 22 :
Direct Intercity Connectivity
between principal centres of
Northern Powerhouse and
neighbouring major cities**

All these problems are avoided by HSUK's design as an integrated national network. High speed services will interlink most principal cities, irrespective of whether they are located inside or outside the Northern Powerhouse region. HSUK will achieve 77 direct city-to-city connections out of a possible 102, while HS2 achieves a derisory score of 2 out of 102.

It is significant also to note how valuable HSUK's Woodhead transpennine crossing will be in improving wider interregional connectivity. Figure 22 shows 24 links out of 102 routed via Woodhead.

7.1.7. A Vision for Northern Powerhouse Railfreight

The TfN *Strategic Transport Plan* declares a laudable ambition for a '**Freight Superhighway connecting Liverpool and the Humber**'²¹. However, it fails to demonstrate any substantive strategy to develop the dedicated transpennine freight route necessary to link the region's industry, ports and population centres without congestion.

Current initiatives, supported by both Government and Transport for the North, to reopen the Skipton-Colne line (noted **(7)** below) offer only limited capacity for transpennine flows. Problems are particularly severe at Leeds West Junction **(8)**, but more generally conflicts at many locations with existing (and increasing) passenger traffic will limit this route's potential to accommodate new freight traffic.

Moreover, Skipton-Colne reopening will not address either:

- the more central Liverpool-Manchester-Sheffield axis, where road congestion on M62, M60 and A628T Woodhead Road (linking Manchester-Sheffield) is critical.
- Any requirement for increase in loading gauge beyond 'W12' container gauge.

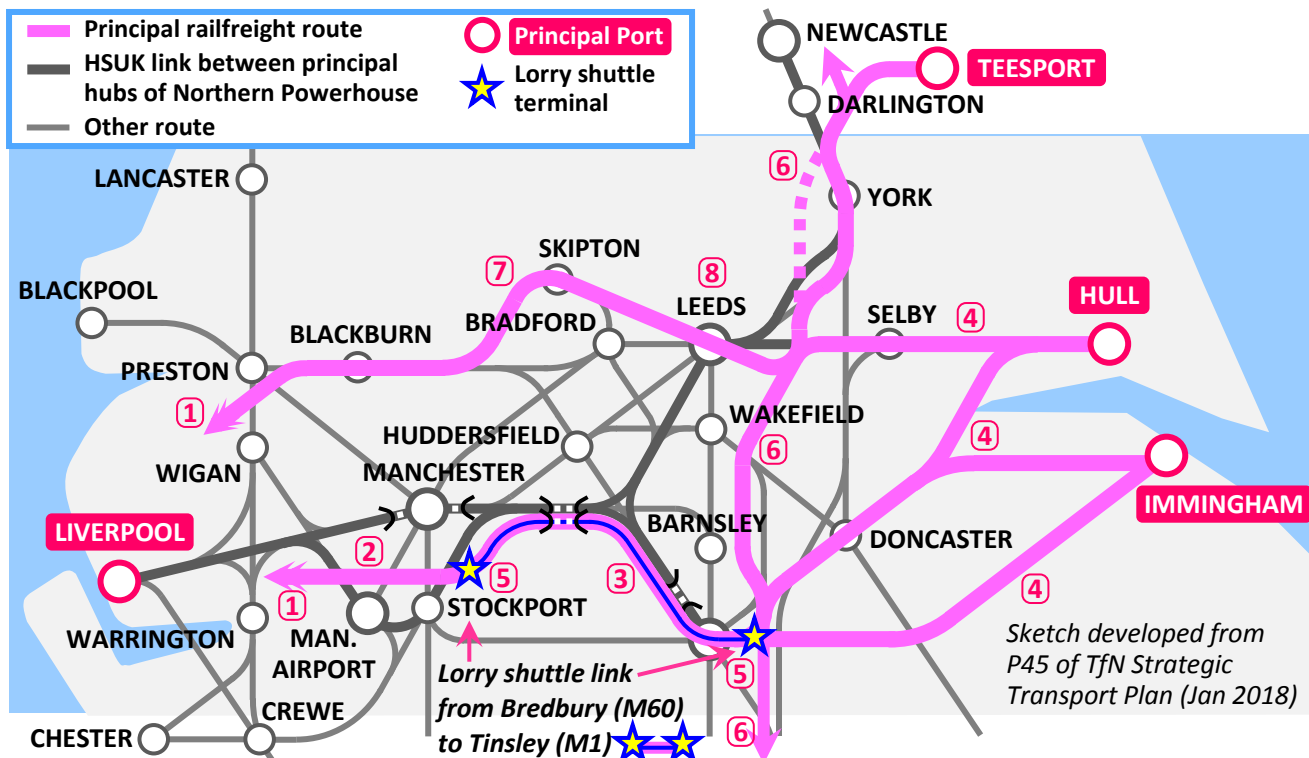


Figure 23 : High Speed UK Transpennine Freight Strategy

The HSUK railfreight strategy indicated in Figure 23 includes Skipton-Colne reopening **(7)**, but more importantly it proposes restoration of the abandoned Sheffield-Manchester Woodhead route **(3)** and the combination of other restored routes into a South Manchester bypass for freight **(2)**, to create:

- a coast-to-coast freight route **(1),(2),(3),(4)** along which freight services will be 'prime user' on critical sections.
- a regional and national freight network **(1),(2),(3),(4),(6)** with enhanced loading gauge capable of accommodating long-distance 'piggyback' services (i.e. articulated HGV trailers on rail wagons).
- a Channel Tunnel-style lorry shuttle link between Sheffield and Manchester **(5)**.

²¹ P34, *Strategic Transport Plan*, Transport for the North, January 2018.

The Requirements Statement set out in Appendix D identifies 6 key issues for freight transport in the Northern Powerhouse region:

- a) the congestion on existing transpennine road routes, in particular the A628T 'Woodhead' road between Manchester and Sheffield;
- b) the lack of capacity for freight traffic on existing transpennine rail routes;
- c) the lack of any east-west cross-Manchester routes avoiding Piccadilly and Victoria stations;
- d) the restricted structure gauge existing on all transpennine routes, that prevents the operation of 'W12' container traffic and other larger 'Continental gauge' wagon formats;
- e) the poor connectivity of the region's ports (in particular Liverpool, Immingham, Hull and Teesport) to their hinterlands;
- f) the limited extent of these hinterlands, generally restricted by the lack of capacity on transpennine rail routes.

Table 24 below evaluates the performance of TfN and HSUK railfreight strategies in addressing these 6 critical issues (bracketed numbers refer to Figure 23):

Issue	NPR Freight Strategy: Skipton-Colne (S-C) reopening	HSUK Freight Strategy: Woodhead reopening	Winner
a) Congestion on transpennine roads	S-C reopening (7) will do little to relieve M62 congestion, and nothing to relieve the critical A628T Woodhead corridor (3) .	HSUK strategy for Woodhead reopening (3) & cross-Manchester freight route (2) achieves high capacity 'prime user' freight route from the North-West to Yorkshire.	HSUK
b) Lack of transpennine capacity	Capacity of reopened S-C route (7) limited by congestion at Leeds West Junction (8) and elsewhere.	HGV congestion on both M62 and A628T Woodhead Road hugely reduced. HSUK strategy includes Skipton-Colne reopening (7) .	HSUK
c) No cross-Manchester freight route	S-C reopening does not address this issue – too far north (7) .		HSUK
d) Restricted structure gauge	S-C reopening (7) will achieve at best a transpennine freight route with W12 capability ie 2.5m containers on standard flat wagons.	Woodhead reopening (3) part of HSUK strategy for larger 'Continental gauge' (UIC-C) freight network (6) interlinking all principal UK conurbations. Enhanced structure gauge for lorry shuttles (5) on Woodhead route.	HSUK
e) Poor connectivity to ports	Still to be resolved (4) ; greatest problems with enhanced rail access to Liverpool Superport (1) .	Still to be resolved (4) ; greatest problems with enhanced rail access to Liverpool Superport (1) .	-----
f) Limited extent of port hinterlands	S-C reopening (7) has restricted capacity and is located too far to north to resolve this issue.	Woodhead reopening offers far greater capacity and has superior, more central location.	HSUK

Table 24 : Comparison of NPR and HSUK Transpennine Freight Strategies

The HSUK railfreight strategy will not create a fully dedicated transpennine route for the exclusive use of freight trains. However, it will create a network of gauge-enhanced routes on which freight traffic will be the 'prime user', with express passenger traffic diverted to other routes. As such, the HSUK railfreight strategy appears to align closely with TfN ambitions for a '**Freight Superhighway connecting Liverpool and the Humber**', and it is documented further in Appendix E7. Work is currently in progress to better define options for improving rail access to the proposed 'Liverpool Superport'.

7.1.8. Minimised Dependency on HS2

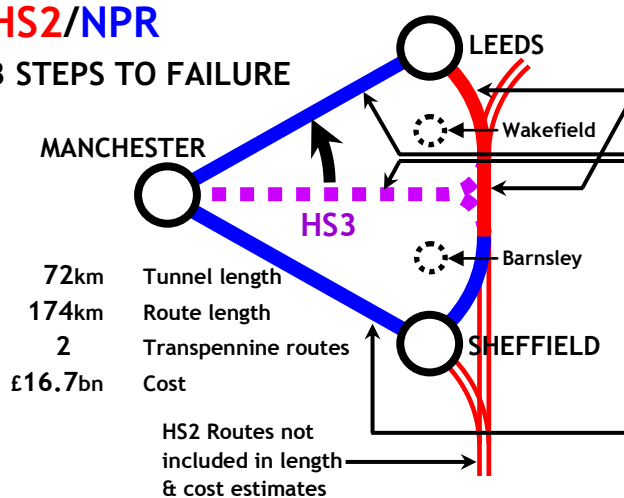
The TfN *Strategic Transport Plan* makes it abundantly clear that its proposals – **which are intended to transform transpennine connectivity** – are based upon HS2 – **which was designed with no thought for transpennine connectivity**. Section 3.6 presents detailed evidence to support these assertions.

With HS2's routes in Yorkshire required only to offer north-south links, there was a natural tendency to locate the trunk route in the flatter and more favourable terrain to the east of Barnsley and Wakefield. This made HS2 relatively cheap to construct as a north-south route; however, this route was completely incompatible with the single east-west transpennine high speed line, as stipulated by 'One North' – see Sections 3.2 and 3.3 – that might connect Manchester and Liverpool to Leeds and Sheffield.

Instead – as is confirmed in the TfN *Strategic Transport Plan* – attention has focussed upon developing 2 separate routes, from Leeds to Manchester and from Leeds to Sheffield. Analysis by HSUK indicates that both routes will require tunnels around 33km long to achieve the specified 30 minute journey times.

HS2/NPR

3 STEPS TO FAILURE



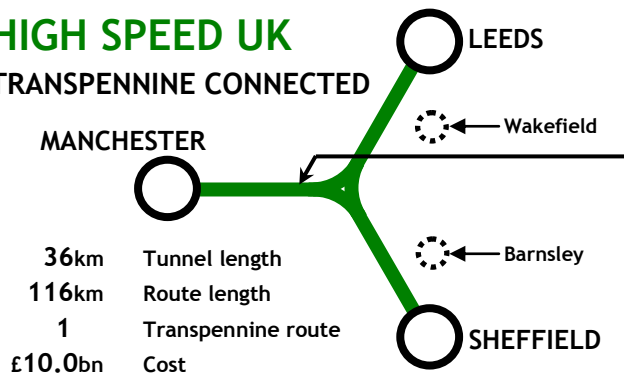
STEP 1 - design HS2 route to east of Barnsley and Wakefield with no thought for transpennine connectivity.

STEP 2 - with HS2 too far to east to integrate with single 'HS3' transpennine route, instead focus creating new Leeds-Manchester route as primary Northern Powerhouse transpennine route, requiring circa 33km of new tunnel.

STEP 3 - finally, examine options for Manchester-Sheffield. With no practicable route through Peak District National Park, another 33km long tunnel will be required.

HIGH SPEED UK

TRANSPENNINE CONNECTED



HSUK's ALTERNATIVE HOLISTIC APPROACH
Integrated development of Sheffield-Leeds route with transpennine route to Manchester via abandoned Woodhead corridor - *all part of integrated development of HSUK national network*

Figure 25 : HS2 and NPR – Epic Fail in the Transpennine Triangle

These problems appear to be directly attributable to HS2's design with no remit to improve transpennine connectivity. This is effectively proven by the 'exemplar alternative' of High Speed UK, which was designed with the single priority of forming an efficient national intercity network, interlinking all major cities. HSUK's response to the challenge of the 'Transpennine Triangle' was to locate its Leeds-Sheffield route in the hillier (and more expensive) terrain to the west of Barnsley and Wakefield, allowing a 'delta junction' connection to a single east-west route to Manchester via the abandoned Woodhead corridor, in full accordance with the original 'One North' scheme (see Figure 3).

The figures show that HSUK's integrated network design would give local cost savings of around £7bn.

7.1.9. A Complete Vision for Northern Powerhouse Rail

Overall, the TfN *Strategic Transport Plan* fails to offer the holistic vision to demonstrate how passenger and freight links between the principal centres of the Northern Powerhouse can be transformed to create an optimised network connecting both the region and the wider nation.

At best, the TfN *Strategic Transport Plan* offers a highly incomplete vision. Whilst certain routes – in particular Leeds to Manchester – appear to have been prioritised to comply with the specification for a 30 minute journey time, most other routes fail either to achieve the specified journey times, or to provide the necessary increased capacity. These are the aims that were at the core of the original ‘One North’ vision for a better-connected and more prosperous North, as set out in Section 3.2.

The greatest failing of the TfN *Strategic Transport Plan* lies with its unquestioning acceptance of the established HS2 proposals. This leads not only to wholly inadequate links to neighbouring Midlands and Scottish cities, but also to a hugely inefficient configuration of rail routes within the Northern Powerhouse region in which two separate transpennine routes, each with extreme (>30km) lengths of tunnel, are required. This adoption of an inefficient and suboptimal network configuration then leads to all the other failings of Transport for the North’s proposals, whether in achieving the specified journey time reductions, or in achieving the higher-capacity and better-connected rail network that the North so clearly needs.

Without this transformed network, rail connectivity within the North will remain poor, and the North-South Divide will remain to blight the economy of the entire nation.

7.1.10. Technical Excellence for the Northern Powerhouse

All the assessments presented in the foregoing sections demonstrate conclusively that HSUK comprehensively outperforms Northern Powerhouse Rail (and HS2) as the option best able to deliver the optimised regional (and national) railway network as defined in this Requirements Statement. It can thus be reasonably concluded that HSUK is also the option best able to maximise the opportunities for sustainable economic growth in the Northern Powerhouse Region.

The Project Scorecard below documents a ‘Nine-Nil’ victory for HSUK in its performance against the Requirements Statement set out in Section 6.

Test		Ref	Winner
1	HS3 Journey Time Specification	7.1.1	HSUK
2	Increased Capacity for Enhanced NPR Services	7.1.2	HSUK
3	NPR Station Location and Configuration	7.1.3	HSUK
4	Longer Distance NPR Services	7.1.4	HSUK
5	Northern Powerhouse Network Connectivity	7.1.5	HSUK
6	Integration of NPR with HS2	7.1.6	HSUK
7	Vision for Northern Powerhouse Railfreight	7.1.7	HSUK
8	Dependency upon HS2/other proposal?	7.1.8	HSUK
9	Complete Vision for Northern Powerhouse Rail	7.1.9	HSUK

Table 26 : Interim Project Scorecard : HSUK 9, Northern Powerhouse Rail 0

7.2. Northern Powerhouse Rail : Performance against TfN '60-minute Criterion'

Possibly in lieu of the HS3 journey time specification established by 'One North', TfN's *Strategic Transport Plan* has introduced a new requirement, to maximise the number of people living within 60 minutes of the 4 principal cities of the Northern Powerhouse i.e. Liverpool, Manchester, Sheffield and Leeds. Transport for the North states that currently, only 10,000 people – all presumed to live in central Manchester – are located sufficiently close to Manchester Piccadilly and/or Victoria to be less than 60 minutes' total journey (i.e. journey to local station, transfer to platform, board train and travel to other city) from the centres of the 3 other cities (and of course Manchester itself).

TfN's ambition is to develop accelerated Northern Powerhouse Rail services so that 1.3 million people would then benefit from being within the '60-minute Criterion'. Under current TfN proposals, it seems highly unlikely that any of the immediate intercity journeys – either to Liverpool, Leeds or Sheffield – can be reduced significantly below 30 minutes, and thus the only locations satisfying the '60-minute Criterion' will be Manchester, and possibly Manchester Airport.

If the Manchester-Sheffield route could be upgraded to offer a 30 minute journey time, then people living up to a radius 30 minutes from central Manchester (and a smaller radius around Manchester Airport) would fall within the '60-minute Criterion'. This would seem to correspond to the 1.3 million potential beneficiaries claimed by Transport for the North.

However, HSUK's analysis demonstrates that no upgrade option (short of a new tunnel 33km long) can practicably deliver Manchester-Sheffield journey times less than 40 minutes. In the continuing absence of credible proposals for a 30-minute Manchester-Sheffield journey, the radius would shrink from 30 minutes to 20 minutes, and the number of beneficiaries would reduce to perhaps 600,000. All of these beneficiaries would be located in Greater Manchester.

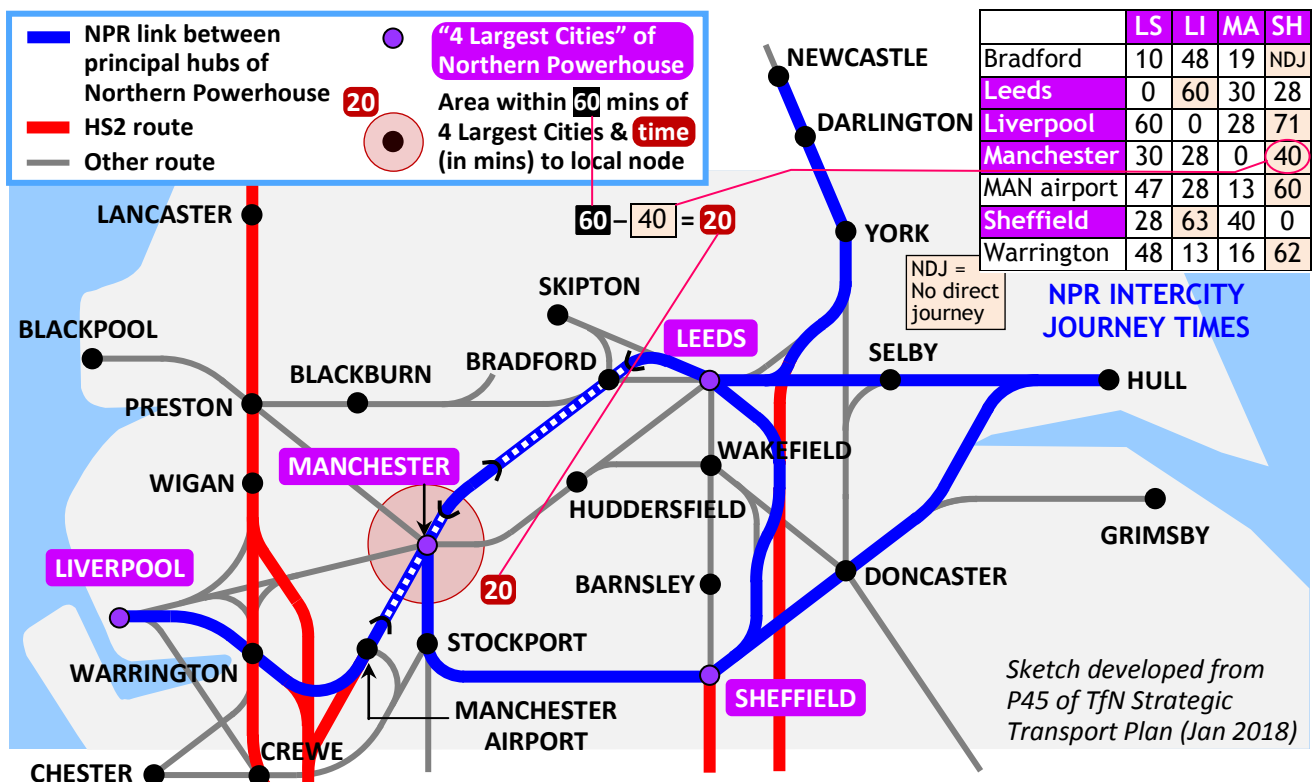


Figure 27 : Areas within 60 minutes of 4 largest Northern Powerhouse cities under TfN proposals

By contrast, HSUK's achievement of significantly greater reductions in intercity journey times will bring Leeds and Sheffield respectively within 46 and 43 minutes of Liverpool. This will then bring residents of Liverpool, Warrington, Stockport, Leeds and Sheffield within the '60-minute Criterion', and it will have the effect of greatly increasing the population benefiting from the improved connectivity, and also of extending these benefits beyond the confines of Greater Manchester. By a simple scaling exercise, around 3.5 million people will fall within the '60-minute Criterion' with the HSUK scheme in place.

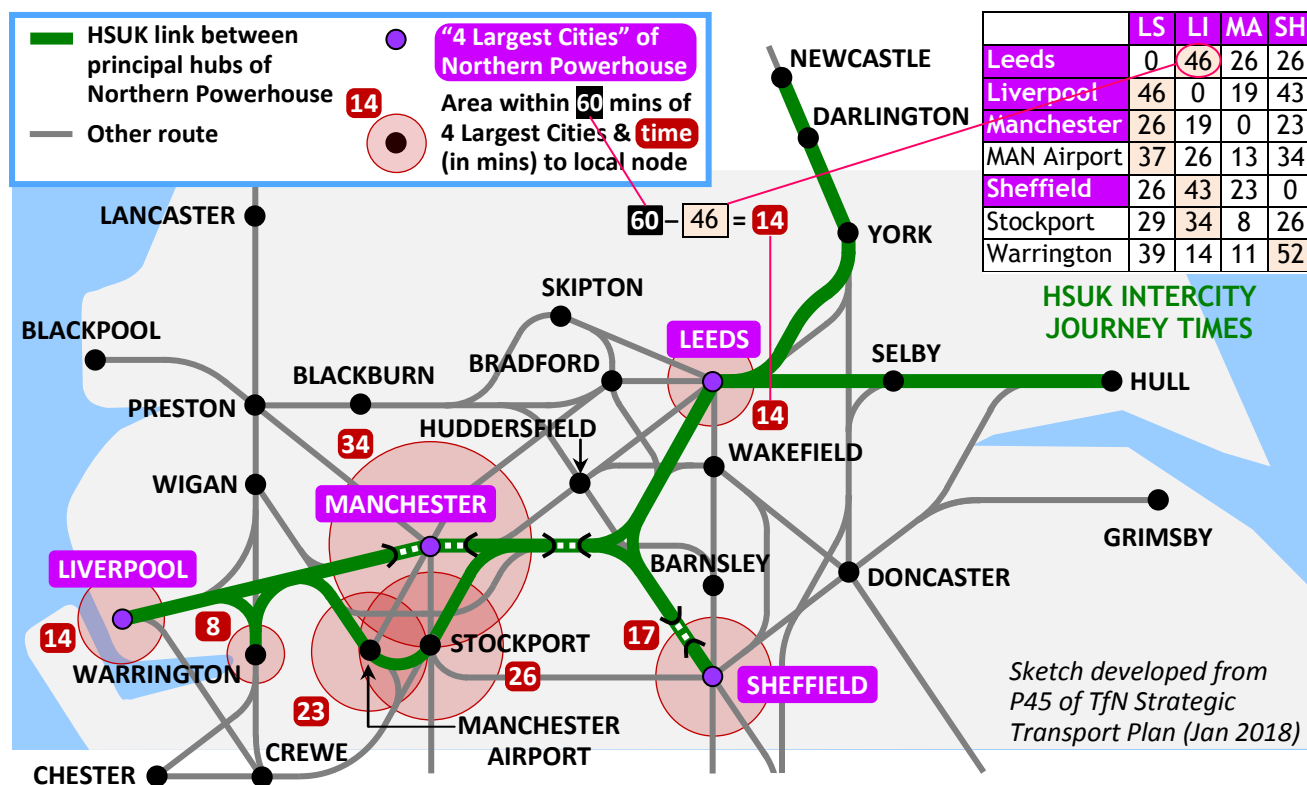


Figure 28 : Areas within 60 minutes of 4 largest Northern Powerhouse cities under HSUK scheme

7.2.1. Performance against '90-minute Criterion'

Currently, there is insufficient information to make any definitive judgement on how many 'prime capability' businesses might be located within 90 minutes of the 4 largest cities (i.e. Liverpool, Manchester, Sheffield and Leeds), either for TfN's Northern Powerhouse Rail proposals or for the High Speed UK scheme.

However, given HSUK's 'order of magnitude' superiority in bringing the people of the North within 60 minutes of the 4 largest cities of the Northern Powerhouse, it seems inconceivable that HSUK would not show a similar superiority improving the connectivity of the region's businesses to the same '4 largest cities'.

7.3. Northern Powerhouse Rail : Assessment of Cost of Proposed Links

Figure 29 below sets out estimated costs and key route data (i.e. length of new-build route and length of new tunnel) for:

- the Northern Powerhouse Rail links defined in the TfN *Strategic Transport Plan* within the Lancashire/ Yorkshire area. Projected NPR routes to Hull are excluded, on account of the current lack of any technical definition. A 33km long tunnel on the Manchester-Sheffield route is included, in order to meet the HS3 Specification for a 30 minute journey time, as originally established by 'One North'.
- Elements of HS2 running to the north and the south.

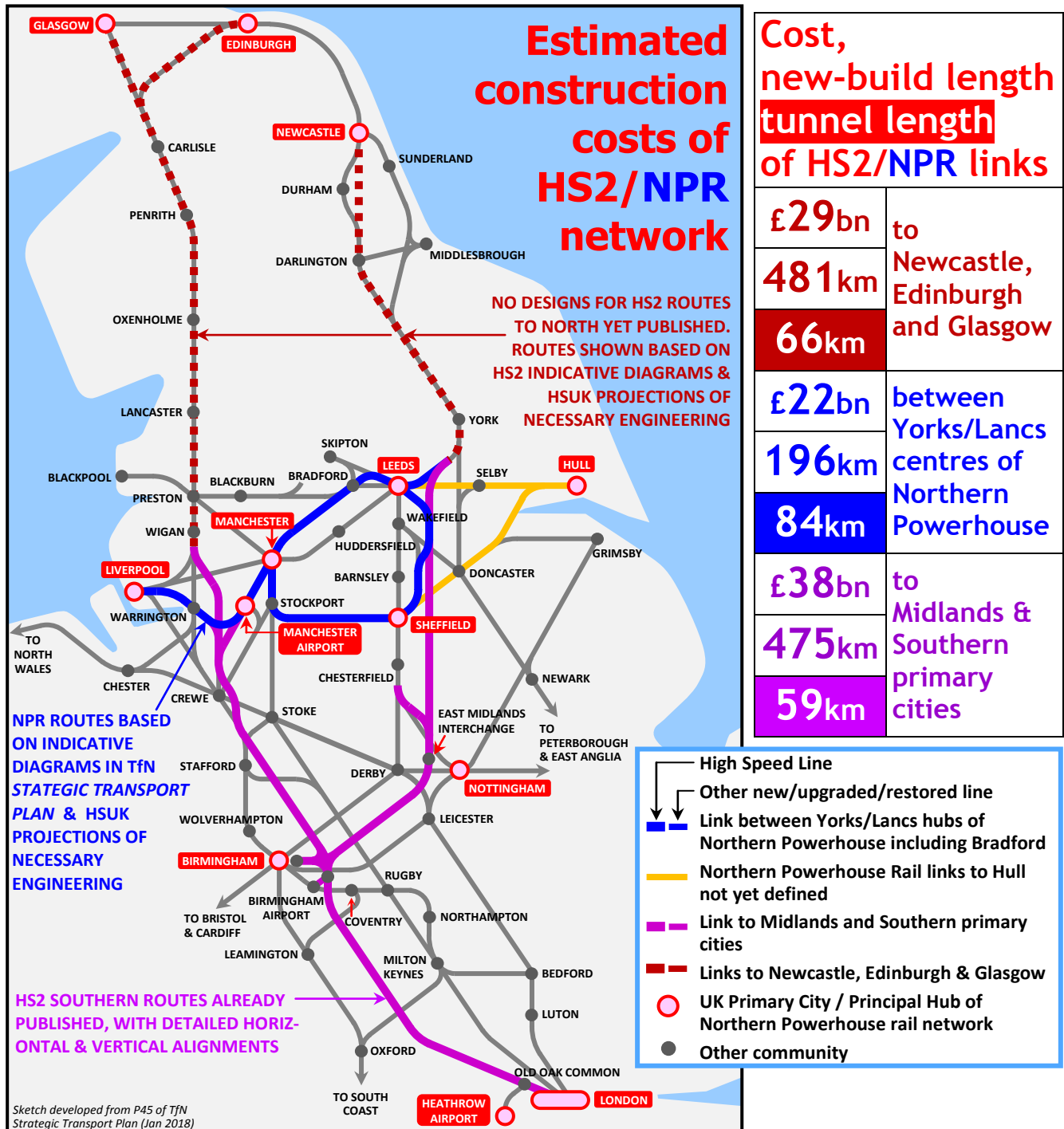


Figure 29 : Cost Estimates for Northern Powerhouse Rail and HS2, by region

Figure 30 below sets out estimated costs and key route data (i.e. length of new-build route and length of new tunnel) for:

- the HSUK elements necessary to provide the specified Northern Powerhouse links within the Lancashire/Yorkshire area, and achieve the journey times defined in the 'One North' *Proposition for an Interconnected North*. Projected HSUK routes to Hull are excluded, on account of the current lack of any technical definition.
- Elements of HSUK running to the north and the south.

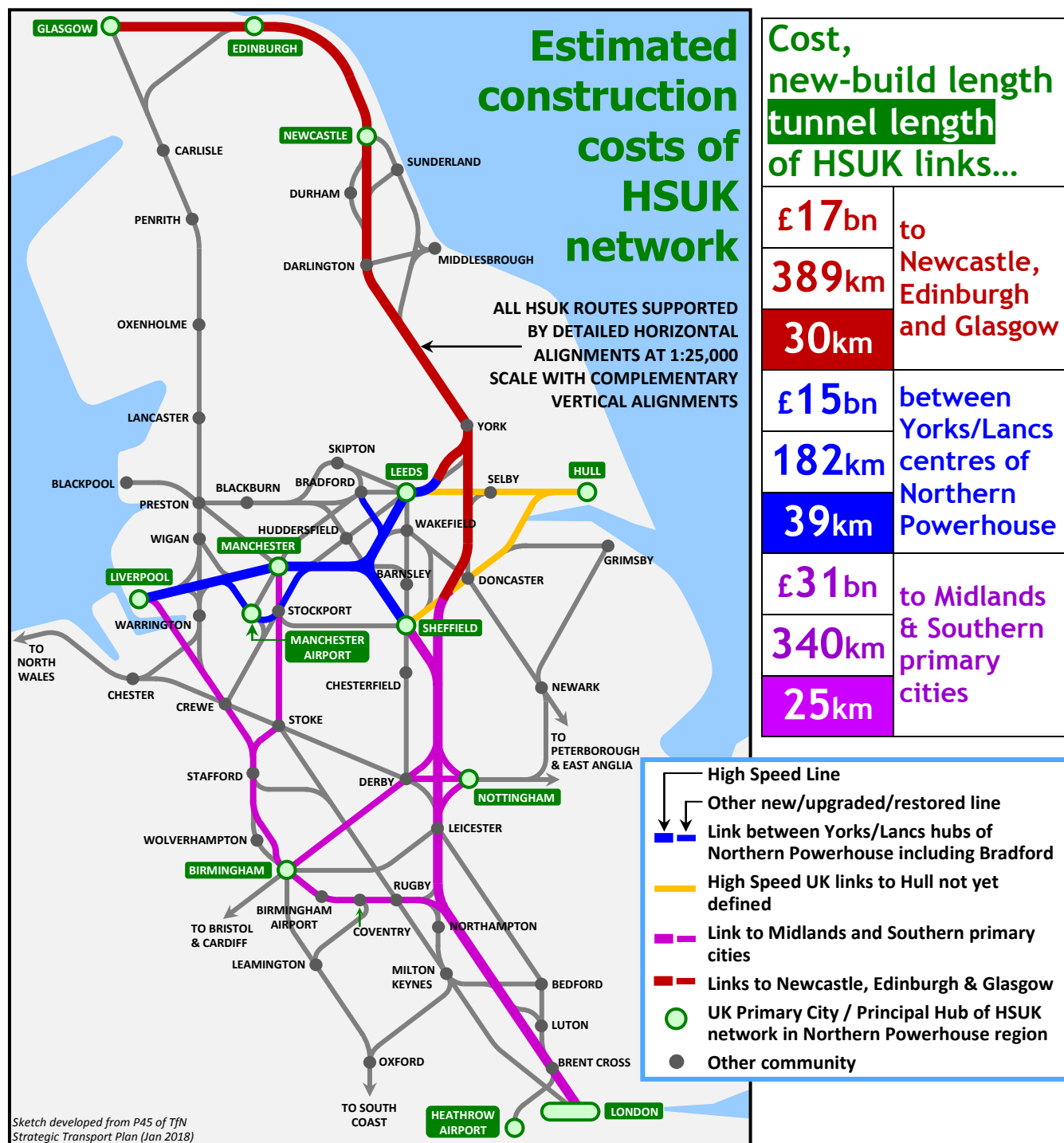


Figure 30 : Cost Estimates for High Speed UK, by region

Zone	Category	HS2/NPR	HSUK	Difference	** 'Upgraded length' includes: a) lengths of existing railway to be upgraded, and: b) lengths of abandoned railway to be restored
High speed links to Newcastle, Edinburgh and Glasgow	Estimated Cost	£29bn	£17bn	£12bn	
	New-build length	481km	389km	92km	
	Upgraded** length	27km	31km	-4km	
	Tunnelled length	66km	30km	36km	
High speed links between Yorks/Lancs centres of Northern Powerhouse	Estimated Cost	£22bn	£15bn	£7bn	
	New-build length	196km	182km	14km	
	Upgraded** length	66km	67km	-1km	
	Tunnelled length	84km	39km	45km	
High speed links to Midlands & Southern primary cities	Estimated Cost	£38bn	£31bn	£7bn	
	New-build length	475km	340km	135km	
	Upgraded** length	5km	209km	-204km	
	Tunnelled length	59km	25km	34km	

Table 31 : Relative Cost and Route Length Parameters for HS2/NPR and HSUK

The costs and route length parameters for Northern Powerhouse Rail, and for southern and northern sections of HS2, are summarised in Table 31, and contrasted with High Speed UK. The comparisons show a consistent picture; the HSUK works required to connect the Northern Powerhouse, and to achieve north-south links equivalent to those of HS2, will cost of the order of 20-30% less than official proposals, yet will – as is demonstrated throughout this report – achieve far superior connectivity.

HSUK's lower costs can broadly be attributed to the shorter length of new-build route and the far shorter length of tunnel that the scheme requires, when compared with relevant sections of Northern Powerhouse Rail and HS2. Only on the criterion of upgraded/restored route does HSUK require greater lengths than those of either Northern Powerhouse Rail or HS2.

Within the Northern Powerhouse region, the cost differences between HSUK and the TfN proposals can be ascribed to one primary factor – TfN's design of a Northern Powerhouse Rail network requiring two new transpennine rail routes, both incorporating extreme (>30km) lengths of tunnel, to enable the journey time targets of the HS3 Specification to be met. The HSUK 'exemplar alternative' demonstrates clearly that the journey time targets can be easily met, and beaten, with a single transpennine route via Woodhead, and much shorter lengths of tunnel, and a scheme cost lower by £7 billion.

7.4. Northern Powerhouse Rail : Assessment of Timescale

No detailed assessment has yet been made of the timescales necessary to construct either TfN's proposals for Northern Powerhouse Rail, or the High Speed UK 'exemplar alternative'. However, given the simple fact that HSUK only requires one short new transpennine tunnel rather than two much longer tunnels required by Northern Powerhouse Rail scheme, it seems certain that HSUK will have a far shorter timescale to completion.

7.5. Overall Review of NPR and HSUK Performance

As has been demonstrated in all the previous pages of this report, HSUK enjoys comprehensive technical superiority over Northern Powerhouse Rail (and HS2) on almost any conceivable comparator. It will also be cheaper to construct, by several billions of pounds, and it will require a far shorter timescale to implement.

HSUK's massive superiority also definitively discredits Transport for the North's claim²²: ***'Together with the existing mainline route network, HS2 and Northern Powerhouse Rail can create a flexible set of services to maximise the economic outcomes for the UK'***. This can only happen with an optimised and fully integrated network, as has been developed for the HSUK scheme. There is no indication that the same level of integration and efficiency can possibly be achieved for TfN's proposals, given their predication upon the established (and fundamentally segregated rather than integrated) HS2 scheme.

It is now possible to finalise the Project Scorecard:

Test		Ref	Winner
1	HS3 Journey Time Specification	7.1.1	HSUK
2	Increased Capacity for Enhanced NPR Services	7.1.2	HSUK
3	NPR Station Location and Configuration	7.1.3	HSUK
4	Longer Distance NPR Services	7.1.4	HSUK
5	Northern Powerhouse Network Connectivity	7.1.5	HSUK
6	Integration of NPR with HS2	7.1.6	HSUK
7	Vision for Northern Powerhouse Railfreight	7.1.7	HSUK
8	Dependency upon HS2/other proposal?	7.1.8	HSUK
9	Complete Vision for Northern Powerhouse Rail	7.1.9	HSUK
10	Transport for the North '60-minute Criterion'	7.2	HSUK
11	Project Cost	7.3	HSUK
12	Project Timescale	7.4	HSUK

Table 32 : Finalised Project Scorecard : HSUK 12, Northern Powerhouse Rail 0

²² P46, *Strategic Transport Plan*, Transport for the North, January 2018

Figure 33 below shows the performance of both Transport for the North's proposals for Northern Powerhouse Rail and the High Speed UK 'exemplar alternative' plotted onto the 'Project Manager's Triangle'. Given HSUK's superior performance in every aspect of specification, cost and timescale, its plotted triangle completely encompasses that of TfN's proposal.

As noted previously, the primary single reason for Northern Powerhouse Rail's poor performance as a network connecting Northern communities is its undue and unnecessary dependency upon HS2. This might be deemed a political externality, but in reality it is an engineering issue revolving around the efficient and optimal functioning of the national rail network, with HS2's new high speed lines in place.

As demonstrated in Section 7.1.6 and Figure 22, HS2 represents a gargantuan multi-billion pound failure of engineering design in its inability to interconnect the UK's major cities. HS2's core dysfunction lies in the total mismatch between its ambition for **'hugely enhanced capacity and connectivity'** between the UK's major conurbations and its actuality, a London-centric funnel that will concentrate national rail connectivity (and therefore prosperity) upon London. This then rebounds upon any scheme such as Northern Powerhouse Rail that is based upon HS2.

This is a technical issue of railway network design, that those guiding the development of Northern Powerhouse Rail should have recognised²³ and addressed, in order to remain true to their political objective of enhancing the rail connectivity, and thereby enhancing the economy, of the North of England.

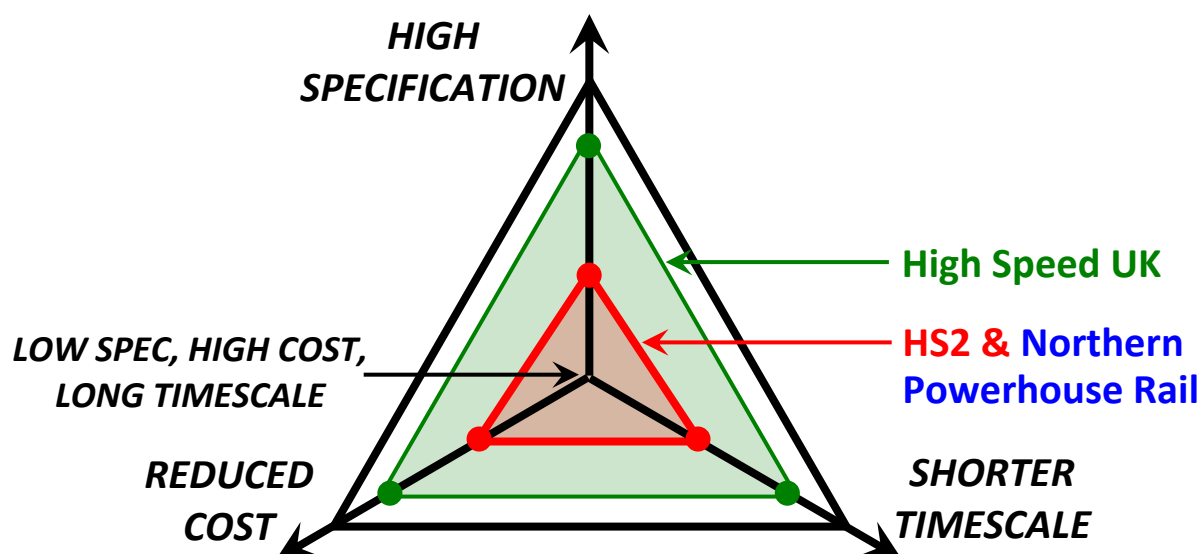


Figure 33 : HSUK comprehensively outperforming HS2 & Northern Powerhouse Rail

²³ It should be noted that HS2's inability to interconnect UK regional cities, or to maintain the integrity of the national intercity network, is well documented in HS2 Ltd's own reports. Table 23 on pages 91-92 of *HS2 Regional Economic Impacts*, HS2 Ltd, September 2013, lists both proposed HS2 services (principally linking larger UK 'primary' cities), and reductions in service levels on existing intercity routes serving smaller 'second-tier' cities. These reductions are caused primarily by the transfer of intercity flows between primary cities to HS2 resulting in fewer passengers to support intercity services on the residual intercity routes on the existing network.

8. Local Implications of Transpennine Route Selection

The fundamental aim of this report has been to assess the fitness of Transport for the North's *Strategic Transport Plan* for its purpose of delivering a rail transport system that will offer maximum economic benefit for the 10 million or more UK citizens in the Northern Powerhouse region. On all grounds of connectivity, capacity, cost, timescale to completion and compliance with the original requirements of the 'One North' initiative, this report has demonstrated the multiple inadequacies of the TfN proposals, and the comprehensive superiority of the High Speed UK 'Exemplar Alternative'.

However, it must be emphasised that the determination of HSUK's superior performance compared with TfN's Northern Powerhouse Rail is generally predicated upon two fundamental tenets:

- The TfN proposals will, in addition to its proposed new transpennine route linking Leeds and Manchester via Bradford, require a further new transpennine route linking Sheffield and Manchester, in order to meet the journey time targets originally set by 'One North'.
- The comparisons made in this report essentially define the 'greater good', with no reference to specific communities that might be advantaged or disadvantaged by either HSUK or NPR.

It is necessary also to consider the implications of:

- Northern Powerhouse Rail delivered with just one single new transpennine route (via Bradford).
- The headline 'winners and losers' arising from implementation of either HSUK or NPR. This issue can be resolved by considering the connectivity implications of the HSUK and NPR schemes for the cities of Bradford and Sheffield.

8.1. Northern Powerhouse Rail with Single Transpennine Route

With no new transpennine route between Manchester and Sheffield, and the existing Hope Valley route upgraded instead, the following implications can be anticipated for the performance of a Northern Powerhouse Rail network:

- Detailed analysis of the Hope Valley route (see Appendix E1.2) indicates that the existing route cannot practicably be upgraded to achieve the 30 minutes Manchester-Sheffield journey time specified by 'One North'. The track alignment is dictated by the mountainous landscape, and it is not feasible to ease the curves to allow faster speeds. If speed limits are set to the maximum speeds permitted for each curve, a 40 minute journey time is the best that can be achieved. However, given the competing use of the line by freight and slower passenger traffic, journey time savings will be smaller than the calculation indicates. Analysis also indicates that use of tilting rolling stock would deliver only small additional gains. (Refer 7.1.1 and Appendix E1).
- With the route remaining largely a 2-track route, there will be insufficient capacity to accommodate either the projected 6 train per hour service frequency, or any increase in freight or local services. (Refer 7.1.2).
- All the connectivity deficiencies arising from routeing Sheffield-Manchester-Liverpool services via a central Manchester terminus will still apply. (Refer 7.1.3 and 7.1.4).
- Even a fully upgraded Hope Valley route cannot practicably satisfy the 'One North' requirement for a transformational capacity increase in transpennine freight services. (Refer 7.1.7).
- With the cost of a second transpennine tunnel eliminated, HSUK's cost advantage over the TfN Northern Powerhouse Rail proposals will reduce from £6.7 billion to £2.3 billion. (Refer 7.3).

8.2. Connectivity Implications for Sheffield and Bradford

It is clear that Sheffield is the greatest single 'loser' from TfN's decision to develop a new transpennine route along its chosen 'North Transpennine' corridor. This route will link Liverpool, Manchester Airport and Manchester via Bradford to Leeds, Hull and Newcastle; yet in the absence of any equivalent new 'South Transpennine' route, Sheffield will be excluded. This will only compound the connectivity problems of a city which is already poorly served by the HS2 scheme.

The routing of TfN's proposed new line via Bradford would seem to bring about an unprecedented gain in connectivity for a city that currently has very poor rail links. However, there must be major concerns over a situation whereby Bradford's gain appears to be Sheffield's loss. The ideal proposition would be one that delivers significant connectivity gains for both cities, provides dynamic city centre stations facilitating local regeneration, and at the same time eliminates any deficiencies that exist in the local networks serving each city.

On such considerations, HSUK's proposals for both Sheffield and Bradford would appear to significantly outperform those of TfN and HS2 Ltd.

Under Transport for the North's and HS2 Ltd's proposals:

- **Bradford** will be well connected only along the axis of the new transpennine route; it will still lack direct links on key routes to London, Birmingham and Sheffield.
- There is presently no certainty either that the new transpennine route will serve **Bradford** at a city centre station, or that the required 33km long tunnel will be technically and operationally feasible.
- The proposals will do nothing to improve **Bradford's** present dysfunctional rail network, whereby its two terminus stations serve separate networks to north and south, and lack any cross-city link. There is no comparable inland English city with similar disconnection between two opposed terminus stations, and this must in part account for Bradford's depressed economy relative to its neighbours.
- **Sheffield** will enjoy only limited connectivity gains, effectively 'parked on a siding' by both Transport for the North's and HS2 Ltd's proposals.

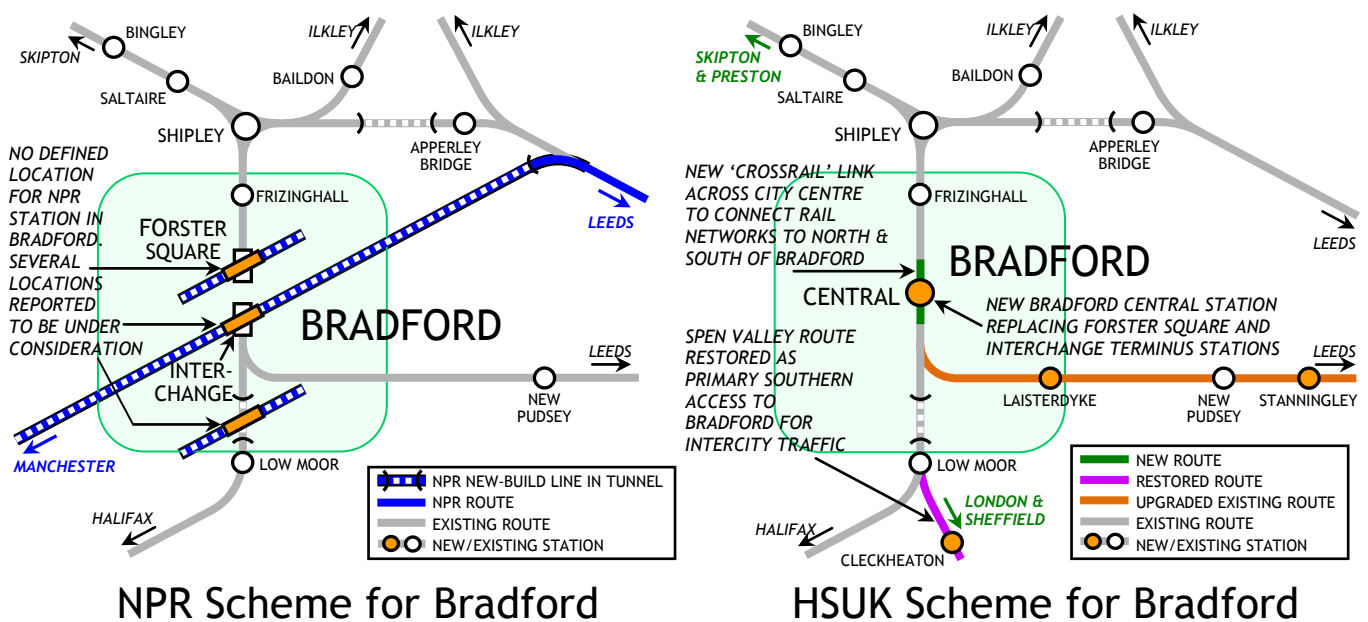


Figure 34 : Northern Powerhouse Rail and High Speed UK Schemes for Bradford

Under the High Speed UK proposals:

- Restoration of the abandoned Spen Valley route and creation of a new **Bradford** cross-city link will establish a new north-south rail corridor to complement the east-west Calder Valley route. This will provide a direct connection to HSUK's north-south and transpennine routes and achieve unprecedented intercity connectivity for **Bradford**, including fast trains to London and Sheffield.
- HSUK's new cross-city route will cross the Westfield development at second-floor level and will include a new **Bradford Central** station, located on the site of the former Bradford Exchange.
- A new **Bradford** cross-city route will greatly enhance links between communities in the Kirklees, Calderdale and Bradford boroughs of West Yorkshire, and will reduce congestion at Leeds.
- **Sheffield** will be located on a fast through route from London and the Midlands to the North-West, West Yorkshire, and Scotland, which will hugely enhance the city's intercity connectivity. Sheffield Victoria will be restored as the primary intercity hub, with new interchange platforms constructed on the approaches to Sheffield Midland to ensure integration with local services.

From all of the comparisons presented in this report it is clear that HSUK's proposed Woodhead transpennine route will deliver far greater connectivity gains for the entire Northern Powerhouse region (see Appendix E6.1), and for Sheffield (see Appendix E3.2). It also offers far superior performance for Bradford (see Appendix E3.3), when more local issues of cross-city connectivity and balanced performance of the West Yorkshire rail network are taken into account.

It must however be stressed that this is fundamentally an argument revolving around the question of prioritisation. Given the vast cost differential, estimated at around £7 billion (see Section 7.3), between HSUK and TfN's Northern Powerhouse Rail routes linking Manchester, Sheffield and Leeds, there is no reason why a second transpennine route via Bradford should not be built at some time in the future, and still show a significant overall cost saving.

There is of course no question that a second transpennine route via Bradford would not deliver significant connectivity gains, and also provide much-needed extra capacity. The comparisons presented in this report merely indicate that of all potential transpennine crossings, a Woodhead route would offer the greatest gains to the greatest number of stakeholders, and as such it must be constructed first.

	HS2 and NPR Intercity links to		High Speed UK Intercity links to	
	Bradford	Sheffield	Bradford	Sheffield
Birmingham				
Bradford				
Chester				W
Crewe				
Darlington	B			
Derby		X		
Doncaster				
Edinburgh		X		
Glasgow		X		
Huddersfield				
Hull	B			
Leeds	B			
Leicester		X		
Liverpool	B			W
London				
Manchester	B		W	W
MAN Airport	B			W
Newcastle	B			
Nottingham				
Preston				W
Sheffield				
Stockport			W	W
Stoke			W	W
Warrington				W
York	B			
Total journeys improved	8	10	10	26
Direct Journeys made worse	0	4	0	0

	Direct intercity link provided by NPR
	Direct intercity link provided by HS2
X	Direct journey made worse by HS2
	Direct intercity link provided by HSUK
B	NPR link via Bradford tunnel
W	HSUK link via Woodhead

Table 35 : Sheffield & Bradford Links

9. Conclusions

With over 3 years having passed since Transport for the North (TfN) was first charged with developing plans for Northern Powerhouse Rail, it would be reasonable to expect the launch (on 16 January 2018) of TfN's *Strategic Transport Plan* to reveal a dynamic and optimised vision for a transformed rail network for the Northern Powerhouse region.

This is certainly what TfN has claimed; however, all the comparisons presented in this report demonstrate a starkly different reality. Not only do the TfN proposals fail to meet the original journey time specification established in the 'One North' *Proposition for an Interconnected North*, they are also comprehensively outperformed by the 'Exemplar Alternative' of the High Speed UK scheme, on every single technical comparison. HSUK's superior performance exists not just in its superior connectivity, capacity and faster journey times; it will also cost less to build, and it will be much quicker to implement.

The evidence indicates clearly that under the oversight of Transport for the North, the Northern Powerhouse project has regressed, rather than progressed. The detailed design effort underpinning the HSUK scheme proves beyond doubt that the 'One North' vision for a single new transpennine route, aimed at interlinking all of the North's principal centres and offering radically reduced journey times, was eminently feasible; yet the Northern Powerhouse Rail scheme outlined in the TfN *Strategic Transport Plan* falls far short of the 'One North' journey time targets and wider network vision.

This raises the very obvious question of how an official and well-resourced body such as Transport for the North could have failed so disastrously in their development of a scheme intended to serve the public interest, and to represent 'best value'.

There is also the question of how such inadequate and suboptimal proposals could be put forward for public consultation without meaningful peer review, that would have revealed their deficiencies. The current consultation exercise might constitute some form of peer review, but the track record of public bodies such as Transport for the North in taking note of critical responses is poor. TfN's stated intention is to use the public's responses to the consultation to guide the work of consultants who will shortly be remitted to take the Northern Powerhouse Rail proposals to the next stage of development. However, no amount of consultants' input can remedy the fundamental flaws revealed in this report; it will simply have the effect of squandering still more public money.

There are possibly many factors to account for TfN's failure to develop a fit-for-purpose and optimised suite of railway initiatives to deliver step-change connectivity improvements, and thus stimulate the economic development of the Northern Powerhouse. However, the simplest explanation appears to lie with the unhealthy and pervading dependency of TfN's proposals upon the established HS2 scheme. The primary purpose of Northern Powerhouse Rail (and indeed the original 'HS3' concept put forward by 'One North') was to transform transpennine connectivity – so to shape Northern Powerhouse Rail around the HS2 routes which were not designed with any consideration of transpennine connectivity, would seem to be at the very least illogical, and extremely unwise.

Yet TfN failed to recognise this danger, and failed to question HS2's inappropriate routes, either in Yorkshire or in Greater Manchester. In Yorkshire, this failure has led to an HS2 route incapable of integration with any single transpennine 'HS3' route, and as a consequence it has led to the necessity for two separate transpennine routes, each requiring long and highly expensive tunnels. In Greater

Manchester, the same failure to question has led to a circuitous (and expensively tunnelled) Manchester-Liverpool route incapable of meeting its 20 minute journey time target.

Comparisons with HSUK show that the undue and unnecessary dependency of Northern Powerhouse Rail upon the established HS2 scheme will result in additional costs of at least £7 billion.

The failure of TfN's *Strategic Transport Plan* is underlined by HSUK's massively superior performance on any conceivable criterion, be it cost, connectivity, capacity or compliance with the original HS3 Specification established by 'One North'. HSUK's success in effectively meeting all 'One North' aspirations can be attributed to two simple facts – its design to robust principles of railway engineering and network performance, and its independent development, free of any undue influence from HS2 or other established scheme.

All this indicates a crucial failure on the part of Transport for the North. The requirements of the 'One North' initiative, both for reduced journey times and for wider connectivity improvements, were clear; but TfN has developed proposals for Northern Powerhouse Rail that effectively ignore most of what 'One North' originally called for. The 'One North' requirements were also fully achievable, as is demonstrated by every aspect of HSUK's performance as an efficient and well-connected rail network; but TfN has instead put forward a hugely modified scheme which is inferior in all respects, and which cannot deliver the comprehensive connectivity improvements that the North requires.

As noted previously, the primary cause of Northern Powerhouse Rail's suboptimal performance is its predication upon the established HS2 proposals. If HS2 were the well-engineered and world-leading scheme that its promoters claim it to be, then this might not matter greatly. But when HS2 fails every test²⁴ as an optimised national network, then these failures will inevitably spread into any scheme such as Northern Powerhouse Rail, that is based upon HS2.

These are admittedly problems outside the direct control of Transport for the North; however they are still problems that its leadership should have identified and dealt with in an appropriate manner. The appropriate and proper course of action would have been to:

- a) engage with HS2 Ltd to make the necessary changes to ensure efficient integration between HS2 and Northern Powerhouse Rail; and
- b) inform their political leaders and the wider public of the problem.

However, there is no indication that any of this has happened. Indeed, with senior HS2 Ltd figures on the board of Transport for the North (see Appendix C), there is a clear conflict of interest that will have made truly independent and critical questioning of the HS2 scheme extremely difficult. Instead, TfN has largely accepted HS2 as a given, and has shaped its own proposals around HS2's unmodified routes.

It is difficult to avoid the conclusion that Transport for the North's greatest priority throughout the development of Northern Powerhouse Rail has been to conform with HS2, rather than to develop and deliver the optimised scheme that will best serve the people of the North. This is what the available evidence clearly shows; the challenge is on Transport for the North (and HS2 Ltd) either to present an alternative narrative, or to withdraw their current inadequate proposals in favour of a superior scheme.

²⁴ HS2's inadequate performance as a national network is fully documented in *HS2 – High Speed to Failure* and *HS2 – High Speed to Nowhere*, both available on www.highspeeduk.co.uk

APPENDIX A

The Government's Scheme for the HS2 'Y-network'

HS2 is the Government's scheme for a system of new high speed lines extending northwards from:

- London to the West Midlands (Phase 1);
- The West Midlands to Manchester and the North-West (Phases 2a and 2b);
- The West Midlands to the East Midlands and Yorkshire (Phase 2b).

Together these new lines comprise the HS2 'Y-network', as depicted on Figure A1. The HS2 'Y-network' is planned ultimately to extend northwards along the axis of the West Coast Main Line to Glasgow and Edinburgh, and along the axis of the East Coast Main Line to Newcastle.

Within South and West Yorkshire, it is proposed that HS2 will serve:

- central Sheffield at the existing 'Sheffield Midland' station.
- central Leeds at a new terminus adjacent to the existing 'Leeds City' station.
- a possible parkway station located on the 'M18/Eastern' route bypassing Sheffield.

The M18/Eastern route was adopted in 2017, when earlier proposals for HS2 to serve a station at Meadowhall near Sheffield were abandoned and Sheffield Midland was instead adopted as the sole HS2 station in South Yorkshire. HS2 will connect to the East Coast Main Line near Church Fenton, to allow HS2 services to continue to York and the North-East.

Within the North-West, it is proposed that HS2 will serve:

- Crewe at the new 'Crewe Hub' station.
- Manchester Airport at a new station located 2km from the airport terminals.
- central Manchester at a new terminus station located adjacent to Manchester Piccadilly.

As yet, there are no proposals for a direct HS2 route to Liverpool. Instead, HS2 trains will transfer to the existing network at Crewe, and continue along existing tracks via Runcorn to Liverpool. HS2 will also connect to the West Coast Main Line at Bamfurlong near Wigan, to allow HS2 services to continue to Preston and Scotland.

The HS2 proposals embody two fundamental deficiencies:

- An almost complete lack of integration between HS2's new-build high speed lines and the existing 'classic' network. This leaves most second-tier cities (e.g. Milton Keynes, Coventry, Stoke, Leicester, Derby) bypassed and it prevents HS2 and the classic network from working together to form the enhanced network necessary to meet the HS2 project's fundamental objective of **'hugely enhanced capacity and connectivity'** between the UK's major conurbations.
- No improvement whatsoever to transpennine connections between the principal cities of the North (i.e. Liverpool, Manchester, Sheffield and Leeds). Instead, contrary to its intended effect of stimulating regional economies, HS2 as planned would have the opposite effect of concentrating connectivity and therefore economic activity upon London.

Political pressure from Northern business interests forced the Government to recognise the latter deficiency, leading to the launch of HS3 and the Northern Powerhouse in 2014.

However, the failure to integrate HS2 with other routes has gone largely unrecognised and – as noted in Section 3.6 – there has been no meaningful attempt to integrate the routes offered by HS2 and NPR to create an optimised network interconnecting the principal communities of the Northern Powerhouse.

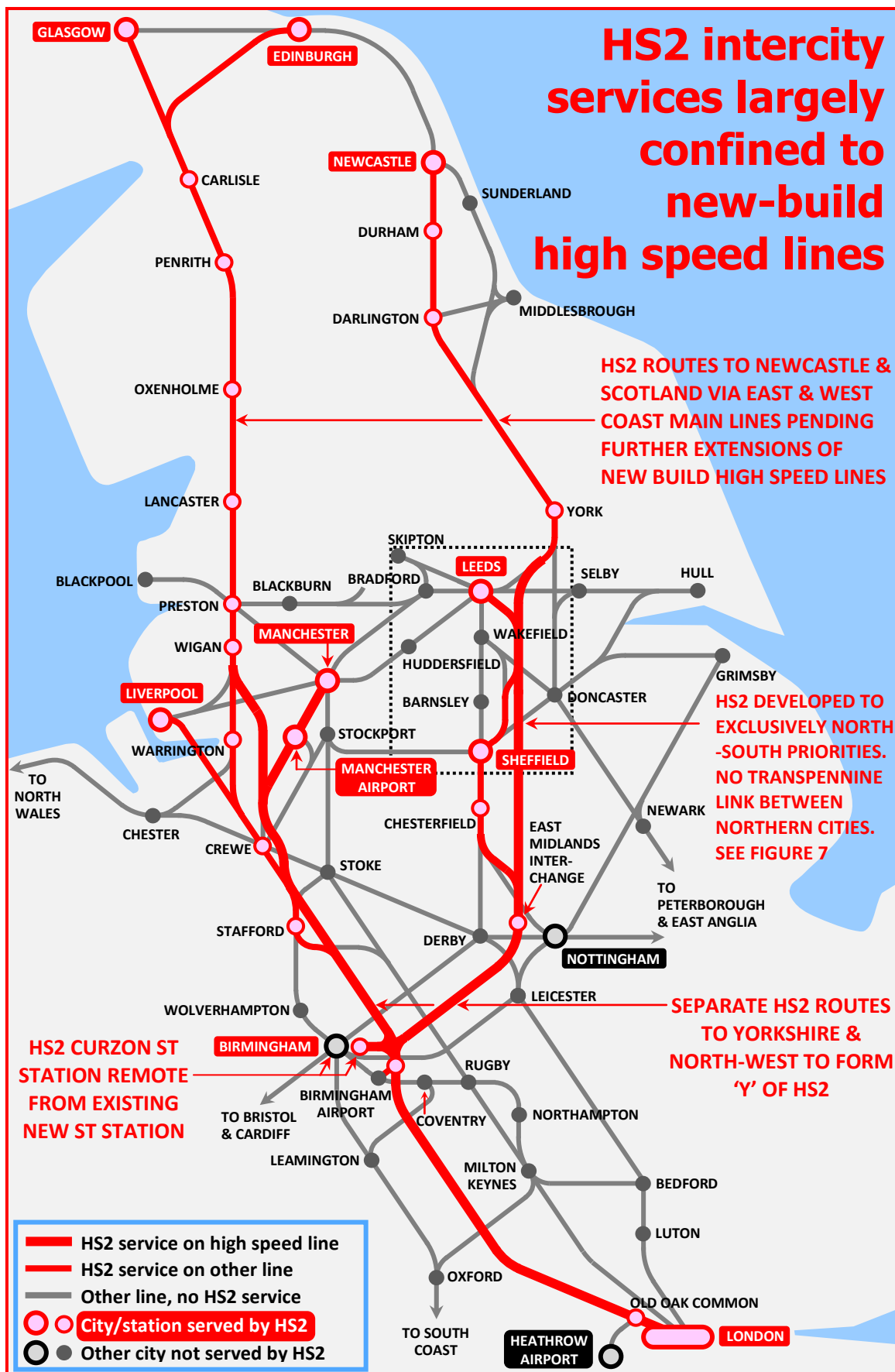


Figure A1 : HS2 'Y-network' extending from London to all major UK conurbations

APPENDIX B

The High Speed UK 'Exemplar Alternative'

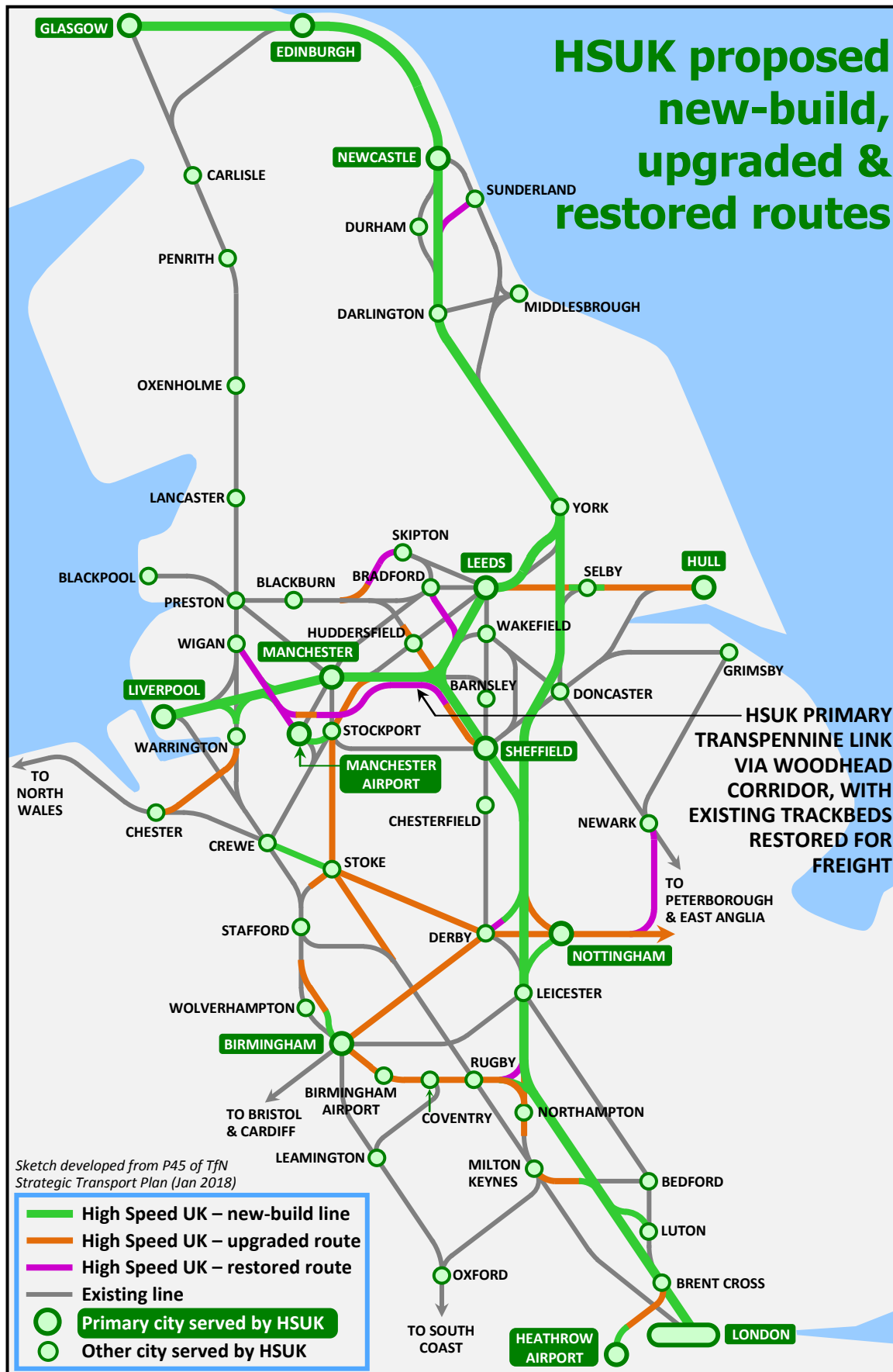


Figure B1 : HSUK 'Spine & Spur' network extending to all major UK conurbations

High Speed UK has been designed as an alternative to HS2, to address its fundamental weaknesses of poor network performance/lack of integration, and its lack of connectivity between the UK regions, most particularly across the Pennines between the major cities of the North. Rather than adhere to HS2's misplaced priorities of excessive speed and exclusivity, HSUK has been developed to diametrically opposite principles of a lower design speed consistent with following existing transport corridors (in particular the M1) and of full integration with the existing network.

HSUK has been designed from the outset to complement and enhance the existing national intercity network, with a blend of:

- new-build high speed lines, including a north-south spine extending from London to Glasgow and a new transpennine route following the abandoned Woodhead corridor to Manchester and Liverpool;
- upgrading of existing routes, with close-spaced connections to the new high speed lines.
- restoration of abandoned routes.

The principal HSUK elements in the Northern Powerhouse region are shown in Figure B2 and Table B3.

HSUK's design – see Figures B1-B4 – is based upon a radically different configuration to the HS2 'Y'. HSUK's 'spine and spur' configuration includes an integral transpennine link via Woodhead that will enable efficient links between all Northern cities. With complementary direct links to Manchester Airport (again achieved through a combination of new, upgraded and restored routes), HSUK can meet all the key requirements of the HS3 journey time specification.

HSUK will serve all principal cities at their existing city centre stations, with the single exception of Sheffield where the former Sheffield Victoria station will be redeveloped as the city's primary intercity hub. In accordance with HSUK's philosophy of full integration, interchange platforms will be provided on the approaches to the existing Sheffield Midland. HSUK's achievement of comprehensive city centre access for high speed services is only possible with radical bespoke interventions in all principal cities; proposed HSUK interventions in Leeds, Bradford, Sheffield, Manchester and Manchester Airport are illustrated in Appendix E3.

HSUK's development is underpinned by comprehensive route design of over 1,000km of new railway. This has enabled development of both rigorous comparative cost estimates between HSUK and HS2, and also a 'demonstrator timetable' to show how HSUK will perform as an optimised national network.

The comparative cost estimates show HS2 and Northern Powerhouse Rail to cost around £26 billion more to build than equivalent sections of HSUK.

On all comparisons of improved connectivity and reduced journey time, HSUK vastly outperforms both HS2 and any transpennine Northern Powerhouse Rail proposals that might develop. It should particularly be noted that despite its design for a lower maximum speed (of 360km/h, as opposed to the 400km/h maximum adopted in the design of HS2's routes) HSUK can offer far greater network-wide journey time reductions. HSUK's design and proposed high speed intercity services are documented on www.highspeeduk.co.uk and in the following principal reports which are also referenced in this study:

- HSUK report *HS2 – High Speed to Failure* (2017).
- HSUK report *HS2 – High Speed to Nowhere* (2017).

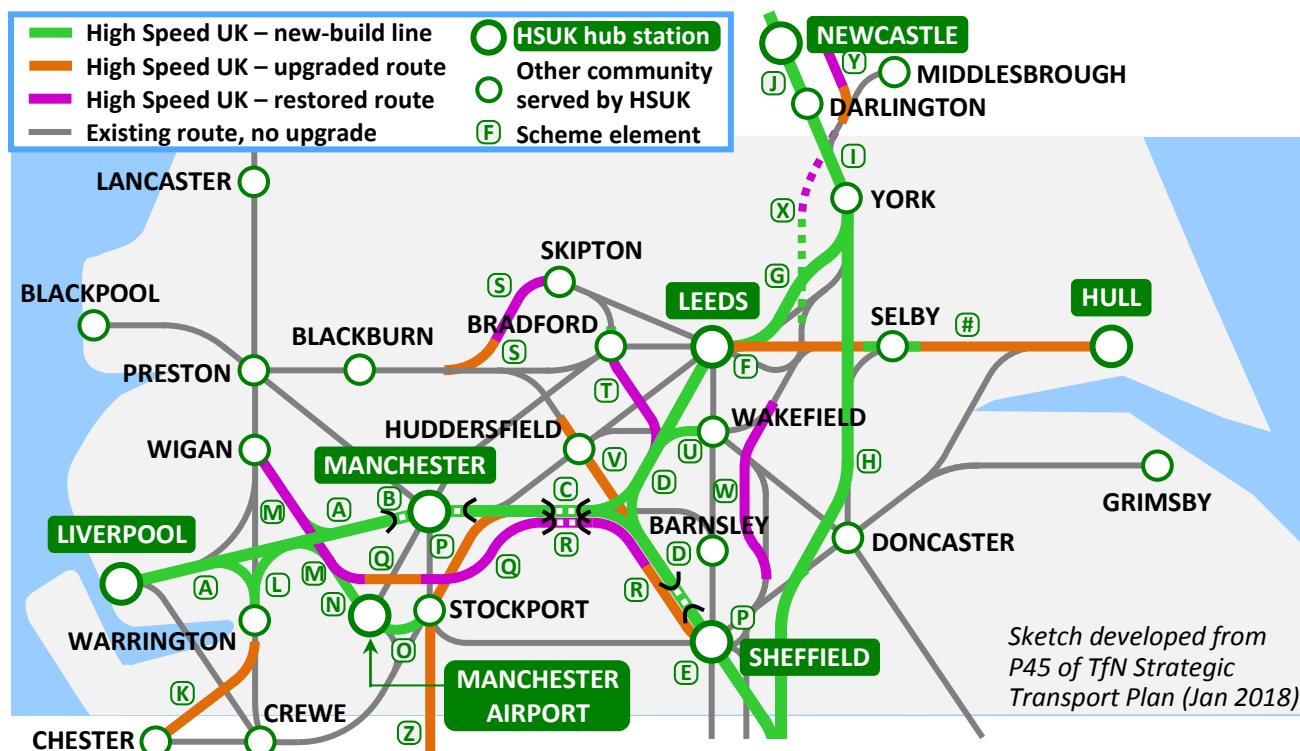


Figure B2 : HSUK Scheme Elements in Northern Powerhouse Region

A	New high speed line following route of M62 and original Liverpool–Manchester Railway	
B	East-West cross-Manchester tunnel with new underground platforms at Manchester Piccadilly. See Appendix E3.	
C	New high speed line along abandoned Woodhead corridor, with 4-tracking of existing line into Manchester	
D	New Sheffield-Leeds high speed line, running to west of Barnsley and Wakefield	
E	New Sheffield HSUK station on former Victoria site, with interchange platforms on approaches to existing Sheffield Midland station. See Appendix E3.	
F	New Stourton-Neville Hill link to increase through working at Leeds station. Farnley Viaduct to south-west restored, route to east 4-tracked. See Appendix E3.	
G	New Leeds-York high speed line, following corridor of A1(M) and A64	
H	‘Yorkshire Bypass’ high speed line following corridor of East Coast Main Line and serving Doncaster and York	
I	Existing York-Darlington line upgraded as 360km/h-capable high speed line	
J	New Darlington-Newcastle high speed line following corridor of A1(M) and bypassing Durham	
K	Chester-Warrington line upgraded to 200km/h standard	
L	New spurs to HSUK north of Warrington, focussing HSUK intercity services on Warrington Bank Quay	
M	CLC routes restored as western access to Manchester Airport and South Manchester freight bypass	See Appendix E3 & E7
N	New western access to Manchester Airport, transforming existing terminus into through station	
O	New eastern access to Manchester Airport from existing Stockport-Crewe line	
P	Guide Bridge-Stockport line upgraded enabling direct access to Manchester Airport from Yorkshire	
Q	Former Tiviotdale route restored as South Manchester freight bypass	
R	Former Woodhead route restored as primary transpennine freight route, part of gauge-enhanced UK ‘freight spine’. Note also lorry shuttle operation from M60 at Bredbury to M1 at Tinsley, and local passenger services	
S	Skipton-Colne route restored as secondary transpennine freight route, with local passenger services also	
T	Spenn Valley route restored as southern access route to Bradford, with new Bradford Central station and new cross-city route allowing services to continue to Aire Valley. See Appendix E3.	
U	Spur to Wakefield and new west-to-north chord allowing high speed services to access Wakefield Westgate	
V	Penistone-Huddersfield route and Bradley Wood chord restored to 2 tracks	
W	Midland Main Line in Yorkshire restored as part of national north-south ‘freight spine’	See Appendix E7
X	New ‘freight spine’ following A1(M) and former ‘Leeds Northern’ route to Northallerton	
Y	Stillington Branch upgraded and former Leamside Line restored as continuation of ‘freight spine’	
Z	Stockport-Stoke line upgraded as element of HSUK Birmingham-Manchester route for sub-60 min. journey time	
#	Proposals for upgrade of Leeds-Selby-Hull route still under development	

Table B3 : HSUK Scheme Elements in Northern Powerhouse Region

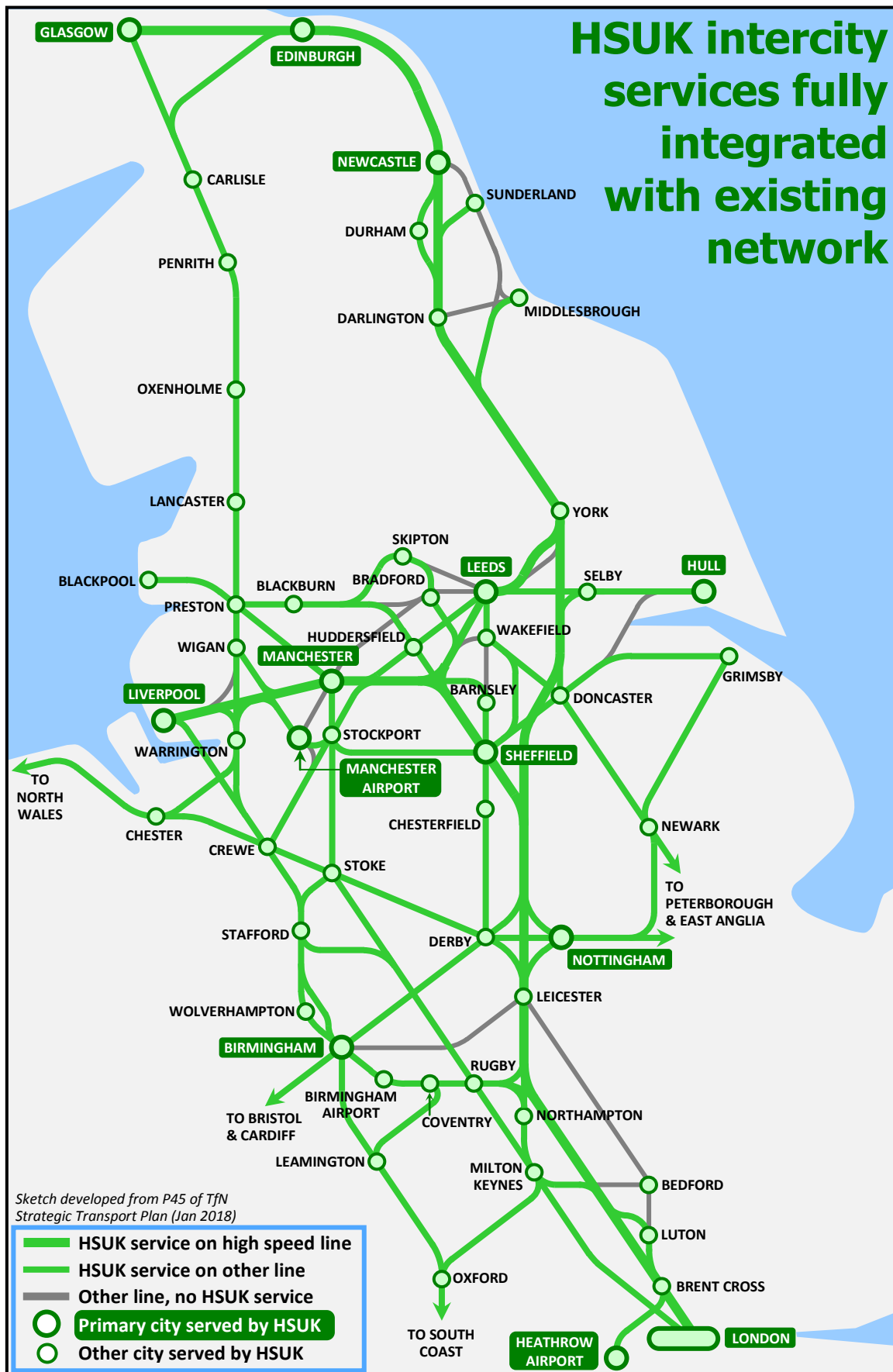


Figure B4 : HSUK Services extending to all principal UK cities

Proposed HSUK intercity services are documented in Appendix A1 of *HS2 – High Speed to Nowhere*, available on www.highspeeduk.co.uk.

APPENDIX C

Transport for the North Corporate Governance

Transport for the North (TfN) is a partnership²⁵ of public and private sector representatives working with central government and national transport bodies to develop and deliver strategic transport infrastructure across the North of England. TfN is governed by a Partnership Board comprising:

- Representatives of principal public transport bodies;
- Representatives of local government;
- Representatives of Local Enterprise Partnerships (LEPs).

Organisation/Region	Representative	LEP representative
Highways England	Jim O'Sullivan	
HS2 Ltd	Paul Griffiths	
Network Rail	Peter Hendy	
Cumbria & Lancashire	Cllr Keith Little (Cumbria) Cllr Phil Riley (Blackburn with Darwen) Cllr Simon Blackburn (Blackpool) Cllr Geoff Driver (Lancashire)	Jim Jackson
North-East	Cllr Nick Forbes (Newcastle)	David Land
Tees Valley	Mayor Ben Houchen (Tees Valley)	Paul Booth
York, North Yorkshire & East Riding	Cllr Carl Les (North Yorkshire) Cllr Ian Gillies (City of York) Cllr Stephen Parnaby (East Riding)	Matthew Lamb
Leeds	Cllr Judith Blake (Leeds)	Roger Marsh
Manchester	Mayor Andy Burnham (Greater Manchester)	Mike Blackburn
Sheffield	Mayor Dan Jarvis (Sheffield CR)	Martin McKervey
Hull and the Humber	Cllr Darren Hale (Hull) Cllr Matthew Patrick (North East Lincolnshire) Cllr Rob Waltham (North Lincolnshire)	Lord Haskins
Cheshire & Warrington	Cllr Rachel Bailey (Cheshire East) Cllr Samantha Dixon (Cheshire West & Chester) Cllr Terry O'Neill (Warrington)	Christine Gaskell
Liverpool	Mayor Steve Rotheram (Liverpool CR)	Robert Hough

Table C1 : Members of Partnership Board of Transport for the North

²⁵ https://en.wikipedia.org/wiki/Transport_for_the_North

APPENDIX D

Requirements Statement for the Northern Powerhouse Rail (HS3) scheme

BACKGROUND

The Northern Powerhouse Rail (HS3) concept was first put forward in the ‘One North’ initiative²⁶, launched in 2014 by the city councils of the principal cities of the North i.e. Liverpool, Manchester, Sheffield, Leeds and Newcastle. The essential purpose of the ‘One North’ initiative was to:

- Remedy the severe congestion and lack of rail connectivity that currently exist both around and between these principal Northern cities.
- Achieve a quality of connectivity on east-west transpennine rail routes equivalent to what HS2 is intended to deliver²⁷ on north-south routes.
- Enable necessary enhancements of the Northern economy through increasing the capacity and connectivity of the regional rail network, and in so doing achieve a wider rebalancing of the UK economy.
- Enable environmental improvements through the transfer of high-emitting road transport flows to lower-emitting rail.

To achieve these goals, the ‘One North’ initiative set out the following key targets to be achieved by any proposals for HS3/Northern Powerhouse Rail:

- A comprehensive specification (hereafter referred to as the ‘HS3 Specification’²⁸) for reduced intercity journey times between the principal cities of the North, and from these cities to Manchester Airport.
- A transformation of east-west transpennine freight routes to enable efficient connection between the region’s ports and its industry.
- Establishment of a new transpennine rail route, necessary to accommodate the anticipated step-change increases in both passenger and freight flows.

Proposals for Northern Powerhouse Rail have been developed by Transport for the North (TfN) and were published for public comment and consultation on 16 January 2018.

²⁶ *One North: A Proposition for an Interconnected North*, ‘One North’, July 2014

²⁷ On 30th November 2015, HS2 Technical Director Andrew McNaughton informed the HS2 Select Committee that the aim of HS2 was “to deliver hugely enhanced capacity and connectivity between our major conurbations.”

²⁸ A specification for reduced journey times between the principal cities of the North was set out in *One North: A Proposition for an Interconnected North*, ‘One North’, July 2014 (P27).

This specification was endorsed and amplified with a requirement for train frequencies in *The Northern Transport Strategy: Spring 2016 Report*, Transport for the North, March 2016 (P25).

A ‘REQUIREMENTS STATEMENT’ FOR IMPROVED TRANSPENNINE LINKS

To guide the development of efficient and optimised HS3/Northern Powerhouse Rail links, the following ‘Requirements Statement’ has been formulated. This comprises a set of balanced performance requirements intended to ensure that the physical intervention of new or upgraded railway lines will form the integrated network necessary to deliver maximised economic and environmental benefits to the widest spread of population.

1. NORTHERN POWERHOUSE RAIL (NPR) JOURNEY TIMES

The new or upgraded routes proposed for the HS3/Northern Powerhouse Rail scheme must be capable of offering the reduced journey times (between Liverpool, Manchester, Manchester Airport, Sheffield, Leeds and Newcastle) set out in the HS3 journey time specification established by ‘One North’ (see Figure 1).

2. NPR CAPACITY FOR INCREASED TRAIN FREQUENCY

The routes and stations proposed for the HS3/Northern Powerhouse Rail scheme must provide the extra capacity for:

- a) new NPR intercity services operating at the specified frequency;
- b) step-change increased frequency in more local services (see Item 3);
- c) increased freight services (see Item 7).

3. NPR STATION LOCATION AND CONFIGURATION

The stations (either new stations, or upgrades of existing facilities) proposed for HS3/Northern Powerhouse Rail must provide the extra capacity necessary to operate both the envisaged increased rail services stipulated by the HS3 Specification and the required step-change increase in local services. As a broad guideline, there should be an aspiration for local services to be doubled in frequency.

This would generally require:

- a) city centre stations, fully integrated with local transport networks and with HS2;
- b) where practicable, intercity services and local services operating on different tracks; and
- c) ‘through’ (rather than terminus) configuration.

4. LONGER-DISTANCE NPR JOURNEYS

The HS3/Northern Powerhouse Rail scheme must offer enhanced ‘through’ journeys on longer-distance routes e.g. Liverpool to Hull or Newcastle, that are not covered explicitly in the HS3 Specification. It would not be acceptable for (say) the Liverpool-Manchester NPR route to terminate at Manchester Piccadilly, whilst the Manchester-Leeds NPR route starts from Manchester Victoria.

5. INCLUSION OF SECOND-TIER CENTRES AND OTHER COMMUNITIES/ NORTHERN POWERHOUSE NETWORK CONNECTIVITY

The benefits of the HS3/Northern Powerhouse Rail scheme must extend from the primary centres (i.e. Liverpool, Manchester, Manchester Airport, Sheffield, Leeds and Newcastle) to create a network covering the ‘second-tier’ centres (e.g. Bradford, York, Warrington, Preston, all in the 100,000 - 500,000 population range), and also to less populous/more peripheral communities, that are not addressed explicitly in the HS3 Specification.

For the purposes of testing performance against this Requirements Statement, the following second-tier centres have been considered:

Bradford, Chester, Crewe, Darlington (for Teesside), Doncaster, Huddersfield, Hull, Preston, Stockport, Warrington, York.

6. INTEGRATION OF NPR WITH HS2

HS3/Northern Powerhouse Rail services must be integrated with those of HS2 to ensure seamless links to neighbouring cities outside the Northern Powerhouse region e.g. Nottingham, Derby, Leicester, Stoke, Edinburgh and Glasgow.

7. NPR VISION FOR RAILFREIGHT

The HS3/Northern Powerhouse Rail scheme must offer a holistic vision for transformed railfreight links across the North. As a minimum, the scheme must address the following existing deficiencies:

- a) the congestion on existing transpennine road routes, in particular the A628T ‘Woodhead’ road between Manchester and Sheffield;
- b) the lack of capacity on existing transpennine rail routes;
- c) the lack of any east-west cross-Manchester routes avoiding Piccadilly and Victoria stations;
- d) the restricted structure gauge existing on all routes, that prevents the operation of ‘W12’ container traffic and other large wagon formats;
- e) the poor connectivity of the region’s ports (in particular Liverpool, Immingham, Hull and Teesport) to their hinterlands;
- f) the limited extent of these hinterlands, generally restricted by the lack of capacity on transpennine rail routes.

The ideal solution would be freight services operating on separate tracks, largely segregated from passenger operations.

8. MINIMISED DEPENDENCY UPON HS2

The HS3/Northern Powerhouse Rail scheme should be a self-standing project, with minimised dependency upon and predetermination by HS2 and other projected schemes. This is essential both to optimise the performance of HS3/Northern Powerhouse Rail in connecting Northern communities, and also to enable its earliest completion.

Where conflicts exist between established HS2 proposals and the requirement for optimised connectivity between Northern communities, these elements of HS2 should be reviewed and amended as necessary to ensure full integration and optimum overall performance.

9. A COMPLETE VISION FOR IMPROVED RAIL LINKS BETWEEN THE MAJOR COMMUNITIES OF THE NORTHERN POWERHOUSE

The HS3/Northern Powerhouse Rail scheme must offer a complete vision for achieving:

- a) the network of accelerated routes between the principal centres of the North, as set out in the HS3 Specification.
- b) equivalent benefits for railfreight links across the Northern Powerhouse region.
- c) the wider stipulations of this Requirements Statement.

If some routes have been prioritised over others, the basis for this choice must be made clear.

10. TECHNICAL EXCELLENCE FOR THE NORTHERN POWERHOUSE

It is naturally assumed that the HS3/Northern Powerhouse Rail scheme that is finally adopted will constitute technical best practice in providing an optimised regional and national railway network, and will thus maximise the opportunities for sustainable economic growth. In this case 'technical best practice' would be represented by the technical solution best able to:

- a) meet the HS3 Specification; and
- b) fulfil all the other rail transport requirements set out above.

‘10 Smart Questions’ regarding Northern Powerhouse Rail (NPR) proposals published by Transport for the North (TfN) January 2018

1. NORTHERN POWERHOUSE RAIL JOURNEY TIMES

Can the routes proposed by TfN meet the HS3 journey time specification?

2. NPR TRAIN FREQUENCY

Can TfN’s proposed routes and stations provide the extra capacity both for new NPR services operating at the specified frequency, and also for step-change growth in more local services?

3. NPR STATION LOCATION AND CONFIGURATION

Do the stations proposed by TfN provide the extra capacity necessary to operate both the envisaged increased rail services stipulated by the HS3 Specification and the required step-change increase in local services? This generally requires city centre stations fully integrated with local transport networks and with HS2, and ‘through’ (rather than terminus) configuration.

4. LONGER-DISTANCE NPR JOURNEYS

Do the TfN proposals offer enhanced ‘through’ journeys on longer-distance routes e.g. Liverpool to Hull or Newcastle, that are not covered explicitly in the HS3 Specification?

5. INCLUSION OF SECOND-TIER CENTRES AND OTHER COMMUNITIES

How will the TfN proposals extend the benefits of Northern Powerhouse Rail to second-tier centres e.g. Bradford, York, Warrington, Preston, and also to less populous/ more peripheral communities? If these centres are bypassed or otherwise excluded, how will adverse economic impacts be avoided?

6. INTEGRATION OF NPR WITH HS2

How will Northern Powerhouse Rail be integrated with HS2 to ensure seamless links to neighbouring cities outside the Northern Powerhouse region e.g. Nottingham, Derby, Leicester, Stoke, Edinburgh and Glasgow?

7. TfN VISION FOR RAILFREIGHT

How will the TfN proposals deliver benefits for railfreight, noting in particular the requirement of the proposed Liverpool Superport for improved cross-Manchester and transpennine freight links?

8. MINIMISED DEPENDENCY UPON HS2

Can the TfN proposals be developed to deliver optimum results without dependency upon or predetermination by the established HS2 proposals?

9. TfN VISION FOR IMPROVED RAIL LINKS BETWEEN PRINCIPAL CENTRES OF THE NORTHERN POWERHOUSE

Do the TfN proposals offer a complete vision for achieving the network of accelerated routes and enhanced railfreight links between the principal centres of the North, as set out in the HS3 Specification? If some routes have been prioritised over others, on what basis was this choice made?

10. TECHNICAL EXCELLENCE FOR THE NORTHERN POWERHOUSE

Do the TfN proposals represent the best technical solution to meet the HS3 Specification and fulfil all the other rail transport requirements set out above, that are necessary to ensure sustainable economic growth in the Northern Powerhouse Region?