Mr Boris Johnson MP
Prime Minister
10 Downing Street
London

Dear Boris

HS2 and the UK High Speed Rail Project – the Design Disaster fully Documented

This communiqué is intended to provide further technical information to amplify the critical concerns that I have summarised in my letter to you dated 8th September 2021.

HS2 and the UK High Speed Rail Project - the True Objective

Many rationales for the HS2 project have been advanced in terms of the economic and societal benefits that it is intended to bring about. But in a technical sense, the best definition of HS2's fundamental purpose has been provided by former HS2 Ltd Technical Director Andrew McNaughton. In evidence to the HS2 Select Committee on 30th November 2015, he stated[1]:

> *"The aim of the HS2 project is to deliver hugely enhanced capacity and connectivity between our major conurbations."*

McNaughton's statement would seem incontrovertible. It defines – or it should define – the objective of a national network in which all major communities should be fully interconnected with high-quality, high-frequency and high-speed direct intercity services - a far cry from the performance of the existing network, as illustrated in Figure A1, Appendix A.

Such a transformed network is plainly vital to realising many core policy goals of your Government's programme including:

- Levelling-up/rebalancing of the UK economy;
- Achieving 'Net Zero' transport sector CO_2 emissions;
- Strengthening transport links between the UK nations;
- 'Building back better' after the Covid-19 pandemic.

All are key questions of national interest, and optimal development of the national rail network is crucial to realising these goals.

HS2 Ltd's Failure to Meet Objective for 'Hugely Enhanced Capacity & Connectivity'

Regrettably, despite McNaughton's statement to the HS2 Select Committee, there is no indication in any of HS2 Ltd's outputs, of any coherent attempt to design HS2 to bring about an optimised national network:

- There is no specification for how the national rail network should perform, with HS2 in place;
- There is not even the most basic assessment of HS2's ability to interconnect the UK's major cities;
- There is no recognition that predication upon HS2 will hugely compromise performance of the wider national network. This can be seen most clearly in the failure of Northern Powerhouse Rail (NPR) to meet its own specification[2] for journey time and service frequency – primarily because its designers saw conformance with the established HS2 as a greater priority than optimal network performance.

[1] HS2's objective of 'hugely enhanced capacity and connectivity' was first stated in *High Speed Rail: Investing in Britain's Future – Decisions and Next Steps*, January 2012, DfT.

[2] The NPR specification for journey time and service frequency between the primary cities of the Northern Powerhouse is set out in *The Northern Transport Strategy: Spring 2016 Report,* published March 2016 by Transport for the North. NPR's and HSUK's performances in meeting this specification are assessed in Appendix C.

Without the necessary focus upon design for optimised network performance, the emphasis instead has been upon developing HS2 as a segregated, stand-alone high speed line that will be the fastest railway in the world[3]. It would appear to have been assumed that the act of building HS2 will somehow bring about a fully integrated national network that will then deliver the desired outcome of 'hugely enhanced capacity and connectivity'.

The extreme folly of this baseless assumption can be seen in the simplified assessments of network performance set out in Figures A1, A2 and A3.

Figure A1 charts the highly London-centric connectivity performance of the existing network, by which London enjoys by far the best intercity links of any UK conurbation. This is both a symptom and a cause of the North-South Divide that has long afflicted the UK economy, and it would seem plain that a more symmetrically connected network, with greatly improved links between regional cities, is essential if 'levelling up' is ever to happen.

Figure A2 charts the connectivity offered by HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH), assuming that all schemes are implemented to their full planned extent. It demonstrates that HS2 will create no new intercity links, its principal achievement being be to make already-fast links to London even faster, while the schemes subsequently introduced to remedy HS2's connectivity deficiencies (i.e. NPR and MRH) will do relatively little to improve interregional links.

Figure A3 additionally highlights the existing intercity/interconurbation links that are projected[4] to be degraded through the implementation of HS2. This would seem to indicate that HS2 could have the effect of making the national network even more London-centric, and therefore working against your Government's levelling-up agenda.

Clearly, none of the outcomes set out in Figures A2 or A3 can be represented as 'hugely enhanced capacity and connectivity'.

The High Speed UK Exemplar Alternative

The true scale of the HS2 project's inadequacies can only be appreciated through comparison with a better-performing alternative, and I would commend to your attention the High Speed UK (HSUK) scheme for a national high speed network[5]. As illustrated in **Figure A4**, HSUK demonstrates that it is possible for a railway system, designed from the outset as a national network, to offer almost compete direct interconnectivity between the UK's major cities.

Ongoing Government Initiatives aimed at remedying HS2 Connectivity Deficiencies

There are signs that officialdom is belatedly waking up to the dangers posed by HS2's failure to integrate with other railway schemes (in particular Northern Powerhouse Rail and Midlands Rail Hub), and by the highly deficient total connectivity offer of the UK high speed rail project, as represented in Figures A2 and A3. Several new initiatives are now in development:

- In February 2020, the Oakervee Review[6] recommended the development of an 'Integrated Rail Plan for the Whole GB Network' to draw together disparate initiatives such as HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH).
- In October 2020, the Government launched the 'Union Connectivity Review'[7] with the aim of strengthening transport links between England, Scotland, Wales and Northern Ireland.
- In May 2021, the Government announced its intention to establish 'Great British Railways' with its core ambition for 'one connected network'[8].

[3] HS2's civil engineering infrastructure has been designed for a potential future operating speed of 400km/h. This is faster than any other high speed rail project anywhere in the world.

[4] Table 23, pp91-92, HS2 Regional Economic Impacts, HS2 Ltd, September 2013

[5] For further details of the High Speed UK proposals see www.highspeeduk.co.uk

[6] https://www.gov.uk/government/publications/oakervee-review-of-hs2

[7] https://www.gov.uk/government/speeches/union-connectivity-review

- In July 2021, the Government made a specific commitment[9] to developing a 'Net Zero' national railway network based upon HS2 and the Integrated Rail Plan.

An Integrated Rail Plan for the Whole GB Network

As noted previously, the 2019/20 Oakervee Review of the HS2 project made the key recommendation for the development of an 'Integrated Rail Plan for the Whole GB Rail Network'. Your Government accepted this recommendation as 'Notice to Proceed' was given for HS2 in April 2020, and work on the Integrated Rail Plan commenced in accordance with published terms of reference[10].

Despite a specific requirement to publish the Integrated Rail Plan by December 2020, your Government has still not published in August 2021. However, it is plain from various items of correspondence that the Integrated Rail Plan is seen within Government circles as key to realising most if not all of the policy aims set out on Page 1 of this communiqué.

The terms of reference also make it clear that the Integrated Rail Plan is to be based upon HS2 Phases 1 and 2a, and upon established proposals for Northern Powerhouse Rail and Midlands Rail Hub; only HS2 Phase 2b is to be considered as any sort of variable.

Regrettably, the ideal of comprehensive intercity connectivity is not recognised either in your Government's terms of reference for the Integrated Rail Plan, or in the extensive work undertaken by the National Infrastructure Commission[11] in the development of options for your Government's consideration. Indeed, neither document lays down any definitive criteria for how the enhanced national or local network resulting from the Integrated Rail Plan should perform.

However, with the key elements of the Integrated Rail Plan – the HS2 'Y-network', Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH) – already well defined, and with no further major interventions proposed, its maximum possible performance in interlinking the UK's major cities can be confidently predicted.

As shown in Figures A1, A2 and A3, the performance of an HS2-based Integrated Rail Plan will be extremely poor; HS2 will create no new intercity links, while NPR and MRH will do little to improve interregional links. And if the rumours of HS2 Phase 2b's cancellation or deferment prove to be correct, then this performance will decay even further.

In the absence of any official criteria for how the Integrated Rail Plan should perform, HSUK has established 7 criteria by which schemes should be assessed:

1. Full compliance with any core specification for journey time and service frequency.
2. Direct links between all principal population centres.
3. Delivery of maximised journey time reductions.
4. Full integration with local networks at city centre stations.
5. Delivery of step-change capacity gains for local services.
6. Provision of radically enhanced capacity for railfreight.
7. Optimisation of direct links & reductions in journey time to principal population centres across national network.

On any of the above criteria, the official proposals, either HS2, Northern Powerhouse Rail or Midlands Rail Hub, perform very poorly. By contrast, HSUK's vastly superior performance both

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[8] P33, *Great British Railways : The Williams-Shapps Plan for Rail*, DfT, May 2021

[9] P9 & P79, *Decarbonising Transport: A Better, Greener Britain,* DfT, July 2021

[10] Terms of reference for the Integrated Rail Plan can be found on:
https://www.gov.uk/government/publications/high-speed-north-an-integrated-rail-plan-for-the-north-and-midlands-terms-of-reference/terms-of-reference-for-an-integrated-rail-plan-for-the-north-and-midlands

[11] *Rail Needs Assessment for the Midlands and the North: Final Report*, National Infrastructure Commission, 2020

as a national network (see Figure A4) and as a regional network (see Appendices B and C) shows that it should meet any logical requirement of a properly remitted Integrated Rail Plan.

The Union Connectivity Review, and Implications for the Union

Your Government's commissioning of the Union Connectivity Review represents a clear acknowledgement that the HS2 project has so far failed to address the major inadequacies in transport links between the UK nations[12]. These inadequacies collectively comprise an existential threat to the integrity of the United Kingdom, that can only be countered through transformational improvements in cross-border links.

The recently published interim report[13] of the Union Connectivity Review should set out a strategy by which the primary cities of Scotland, Wales and Northern Ireland (i.e. Edinburgh, Glasgow, Cardiff and Belfast) could be tied into a transformed national network, and thus remedy the historic disconnect between the UK nations. But the report sets out no such strategy, still less does it establish any core specification to define how the overall UK network should perform, or display any understanding of how this network might be optimised. Instead it merely sets out a predictable list of minor incremental schemes that will do virtually nothing to promote the unity of the United Kingdom and counter the drift toward separatism.

This is not in any way to question the legitimacy of the Nationalist movements in Scotland, Wales and Northern Ireland; the principle of national self-determination, or 'nationalism by choice', has rightly been at the heart of every international treaty since Versailles. However, the continuing failure, of official Government initiatives to deliver the necessary transformation in transport links to the outlying UK nations, effectively constitutes an unwitting but still unforgiveable 'nationalism by neglect'.

Again, the HSUK 'Exemplar Alternative' demonstrates the vast improvements in cross-border links that are achievable with the correct network-based approach. These improvements – and the huge deficiencies of existing strategies - are described in HSUK's submission to the Union Connectivity Review, see Appendix D.

The Great British Railways Initiative[14]

It has long been apparent that the existing organisational structure of the UK railway system, with Network Rail controlling the infrastructure and a variety of franchisees operating the trains, is no longer fit for purpose. Your Government has belatedly accepted that change is necessary, and in May of this year it launched a new initiative to create 'Great British Railways' as a single integrated organisation to run the railway system on the island of Great Britain.

Most importantly, Great British Railways sets out the ambition for 'one connected network'. This will comprise the existing network, appropriately enhanced, and the new works schemes of the UK high speed rail project i.e. HS2, Northern Powerhouse Rail and Midlands Rail Hub. The Integrated Rail Plan and the outputs of the Union Connectivity Review are also cited as key to the Great British Railways vision.

It must however be stressed that no detail is offered as to how these disparate and disjointed initiatives will be integrated to comprise 'one connected network'.

[12] It is particularly pertinent to note that despite many hopeful cross-border lines that were sketched onto maps in the early stages of the HS2 project, no definitive proposals have ever emerged for new HS2 routes north of Wigan or York; and in the absence of any viable cross-border proposals, the capacity-constrained West and East Coast Main Lines will be left to take the strain.

[13] https://www.gov.uk/government/publications/union-connectivity-review-interim-report

[14] Refer to *Great British Railways : The Williams-Shapps Plan for Rail*, DfT, May 2021.

The Ambition for a 'Net Zero' National Railway Network[15]

The growing climate crisis has now led to an imperative to achieve 'Net Zero' CO_2 emissions across all sectors of the UK economy. With transport contributing well over a quarter of national CO_2 emissions, this ambition has translated to the transport sector, and specifically to the development of a 'Net Zero' national rail network.

With the vast majority of transport emissions attributable to high-emitting road vehicles, your Government rightly sees step-change road-to-rail modal shift, for both passenger and freight traffic, as an essential part its CO_2 strategy. This modal shift can of course only happen with transformational enhancement of both the connectivity and the capacity of the existing network, and both HS2 and the Integrated Rail Plan are specifically cited as key elements in your Government's strategy.

However, with both HS2 and the wider Integrated Rail Plan failing to offer either the improved connectivity or the integration necessary to bring about the necessary transformation, your Government's strategy for a Net Zero transport system seems doomed to fail; only the comprehensively connected and fully integrated HSUK can possibly deliver.

This highly embarrassing fact is nothing new. As long ago as 2011, High Speed UK[16] provided a response[17] to the HS2 Phase 1 Consultation which identified HS2's self-declared failure to achieve significant CO_2 reductions as one of HS2's primary inadequacies (and probably illegal in terms of the requirements of the 2008 Climate Change Act). Regrettably, however, HS2 Ltd entirely disregarded HSUK's input. Only now, 10 years later, are the chickens coming home to roost.

Overall Failure of Government Policy

Great British Railways will only comprise 'one connected network' with 'Net Zero' CO_2 emissions, seamlessly extending to all 3 nations (i.e. England, Scotland and Wales) on the island of Great Britain, if the Integrated Rail Plan (IRP) succeeds in bringing about this connected, comprehensive and fully integrated network.

This is a highly unlikely prospect for 4 reasons:

- the IRP is predicated upon HS2 Phases 1 and 2a, which were designed with no thought for integration or optimised network performance.
- the IRP has failed to consider alternative schemes (such as HSUK) that might better deliver the required integrated network performance.
- the IRP has been developed with no specification for its technical performance.
- All the policy ambitions represented by the *Union Connectivity Review*, *Decarbonising Transport* and *Great British Railways* are entirely dependent upon an Integrated Rail Plan which on all available evidence will fail to offer the necessary efficiency, optimisation or integration.

The critical deficiencies listed above represent a catastrophic failure of Government policy. If the Integrated Rail Plan does not deliver the necessary step-change enhancement of the national rail network, then none of your Government's key pledges can be delivered. Instead, the following undesirable outcomes seem likely:

- A hard-wired North-South divide in the UK economy;
- No worthwhile reductions in transport CO_2 emissions;
- Continuing poor transport links between the UK nations;
- Little or no recovery after the Covid-19 pandemic.

[15] Refer to *Decarbonising Transport: A Better, Greener Britain,* DfT, July 2021

[16] In 2011, High Speed UK was operating under the title 'High Speed North'.

[17] All High Speed UK/High Speed North responses to official consultations are compiled in the document *High Speed Trains, Slow Speed Brains*, available as Document A12 on www.highspeeduk.co.uk.

It is significant to note that 8 months after its due publication date, the Integrated Rail Plan remains unpublished. This gives rise to the strong suspicion that the unfortunate functionary who has been tasked with formulating this plan has realised that it is simply not possible to retrofit integration onto disjointed, fragmented schemes which have been designed with no thought for integration.

Similar problems may be afflicting the development of definitive policies to support your Government's 'levelling up agenda'. The House of Commons Business, Energy and Industrial Strategy Committee has recently published a report[18] strongly criticising the apparent absence of any substantive policies that will deliver a 'levelled up' United Kingdom, or even define what this levelled-up UK will look like.

Whilst the report makes no specific reference to HS2, it does list[19] 'the North and the Midlands Integrated Rail Plan' as a 'Levelling-up commitment' given in the 2021 Queen's Speech. But with all evidence showing that an Integrated Rail Plan based upon HS2 cannot possibly deliver the required optimal network performance, there is plainly an 'inconvenient truth' that must be confronted.

Technical Failures of the UK's Transport Establishment

All this begs the very obvious question of how the UK's transport establishment has failed so spectacularly to develop efficient national and local railway networks that will achieve the aims of either the Integrated Rail Plan or the Union Connectivity Review, and thus deliver the Net Zero 'one connected network' now demanded by current Government policy.

The design of a railway network is plainly not 'rocket science'; but it demands the same fundamental technical disciplines of establishing a specification, designing to the specified criteria, and rigorous optimisation against these criteria.

However, any such structured process is conspicuously absent from the outputs of either HS2 Ltd, the National Infrastructure Commission, or the organisations (respectively Transport for the North and Midlands Connect) that have developed Northern Powerhouse Rail and Midlands Rail Hub around the established HS2 proposals. There has been:

- No attempt to assess the performance of the national rail network, with HS2 in place;
- No definition of measurable capacity or connectivity goals to enable this assessment;
- No ambition for the attainment of comprehensive direct intercity services linking all of Great Britain's major conurbations *(surely this would be hugely enhanced connectivity?)*
- No ambition for the integrated development of local and high speed networks in major cities to transform local services *(surely this would be hugely enhanced capacity?)*.

High Speed Line – Slow Speed Network (The HS2 Speed Syllogism)

The extent of the professional and intellectual failure of those leading the HS2 project can be encapsulated in one extraordinary misconception. The decision to design HS2's civil engineering infrastructure for potential 400km/h operation has always been represented as some sort of 'future proofing' against possible advances in high speed rail technology. Yet this decision has also dictated HS2's ultra-straight, environmentally destructive and exorbitantly expensive rural alignments. This has in turn made it effectively impossible to follow existing transport corridors, such as that of the West Coast Main Line, and therefore impossible also to integrate with the existing railway system and thus form an enhanced network.

This folly is exposed by the vastly superior performance of the HSUK Exemplar Alternative, designed to radically different principles as a fully integrated network. With its southern section closely aligned with the M1 motorway, designed for a maximum speed of 360km/h and

[18] *Post-pandemic economic growth: Levelling up* House of Commons Business, Energy and Industrial Strategy Committee, HMG, July 2021

[19] Box 1, P8, *Post-pandemic economic growth: Levelling up*, HMG, July 2021

connected at close-spaced intervals to both West Coast and Midland Main Lines, it can offer network-wide journey time savings that vastly exceed[20] anything HS2 can offer.

Neglect the Network, Neglect the Nation??

The simple truth of the matter is that none of the component elements of the Integrated Rail Plan have been designed with any consideration of an integrated national network; journey time savings along the precise line of route have been the only 'currency' that ever mattered.

With no prior consideration of integration, it is now effectively impossible now for any 'Integrated Rail Plan' to bring about an optimised integrated national network and thereby deliver your policy goals of a levelled-up, greener and more united nation.

Whatever competence your advisors might possess in their particular fields of expertise, they would appear to have no competence whatsoever in the design and development of a national railway network. They have further failed to recognise that the UK rail network is a design entity that is capable of optimisation, to provide the best possible service and value to the people of the United Kingdom. As a consequence, nobody has been remitted to design a network, nobody has had the competence even to recognise the problem – and ultimately, nobody has bothered.

Instead, it has been erroneously and negligently assumed that the act of building new lines such as HS2 will automatically result in a superior and an optimised national network. Indeed, the reverse appears to be true – HSUK's research, as set out in Appendices B and C, shows clearly that predication upon the London-centric HS2 is actually counterproductive to the development of efficient regional networks in the Midlands and the North.

In the absence of the necessary competence in railway network design, the great and the good of the UK transport establishment have developed a series of disjointed railway proposals that are incapable of either rebalancing the economy or connecting the nation.

This neglect of the network effectively constitutes neglect of the nation.

A Challenge to the UK Transport Establishment

If you have any lingering faith in the competence of the UK transport establishment to develop the national railway network, I would recommend that you ask 7 simple questions:

1. How have you assessed and measured HS2's success in delivering 'hugely enhanced capacity and connectivity[21]' between the UK's major conurbations?
2. How have you determined that HS2 is the best means of achieving this objective?
3. How have you designed HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH) to integrate with the UK rail network, and thus achieve the best possible links between all of the UK's major cities?
4. How have you developed the Integrated Rail Plan to remedy the disconnection between HS2, NPR, MRH and the existing railway system, and thus achieve the best possible network interlinking all UK communities?
5. How have you determined that a national railway network based upon HS2, NPR and MRH will bring about the greatest possible road-to-rail modal shift, and thereby make the greatest possible contribution to reducing CO_2 and other greenhouse gas emissions?
6. Where is your network connectivity analysis, to match that undertaken by HSUK[22]?
7. Please explain why the official proposals, variously HS2, NPR, MRH etc, perform so poorly on every conceivable criterion against the HSUK Exemplar Alternative.

[20] Figure 5.66, P141, *High Speed to Nowhere*, Colin Elliff, available as document A03 on www.highspeeduk.co.uk

[21] HS2's objective of 'hugely enhanced capacity and connectivity' was stated in *High Speed Rail: Investing in Britain's Future – Decisions and Next Steps*, published January 2012 by DfT, and repeated in evidence given to the HS2 Select Committee by HS2 Ltd Technical Director Andrew McNaughton on 30th November 2015.

[22] See Appendices B and C. Much further detail can be found on www.highspeeduk.co.uk.

These are all perfectly reasonable questions to ask of your advisors, the leaders of the multi-billion UK high speed rail project. However, I would predict with complete confidence that none of these advisors will be able to give you an adequate answer to any of these questions.

HS2's Cost and Environmental Destruction – just symptoms of a deeper problem

I could have devoted the pages of this communiqué to the exorbitant costs of the HS2 project, running into literally hundreds of billions in wasted capital expenditure and lost economic opportunities. Equally, I could have told you what you must already know about HS2's wanton destruction of natural environments, not to mention homes and livelihoods.

But appalling as these consequences are, they are still only symptoms of HS2's more fundamental flaws – its disastrous performance as a public infrastructure project, its legacy of inefficiency and dysfunctionality inflicted upon future generations, and the unprecedented professional failure of its technical leadership.

HS2 and Great British Railways – two fundamentally incompatible projects

You must surely appreciate that HS2 cannot be an end in itself. It only has any value if it actually brings about the transformed national network that the nation needs – and every piece of substantive technical evidence demonstrates unequivocally that HS2 – and any project based upon HS2 - will fail to deliver on any logical requirement of a national railway network.

HS2 is based upon a dysfunctional and now-discredited 'franchising' model which has concentrated upon only the most lucrative, mostly London-centric flows from principal regional cities. In the process it has neglected every other less lucrative intercity or interregional flow that makes up the national network. This completely contradicts the holistic aim of your Government's Great British Railways initiative for 'one connected network'.

This contradiction will be further exposed by the forthcoming publication of the Integrated Rail Plan. This will place you and your Government in an unsustainable and highly embarrassing position:

- You cannot possibly continue to support a flawed Integrated Rail Plan that is so plainly inefficient, suboptimal and lacking in integration, and so contrary to your own policy priorities and the wider national interest, when a vastly and demonstrably superior alternative exists.
- Pressing on with the highly damaging HS2 proposals can only bring about a permanently dysfunctional 'Great British Railways' network, which will become your legacy.

The Imperative for Prime Ministerial Action

From your perspective as the UK's political leader, I believe that the issue reduces to 2 very simple, if provocative questions:

- Do we want a rebalanced economy, or not?
- Do we want a United Kingdom, or not?

There is of course only one answer, a strong affirmative, that you or any UK Prime Minister could give to either question. But a levelled-up and unified nation will only come about with a radically upgraded national railway network – and for this you are completely reliant upon the technical competence within the UK transport establishment.

In this letter I have set out a compelling *prima facie* case to demonstrate the alarming competence deficit that has pervaded all aspects of the UK high speed rail project. This poses a critical threat to the prosperity, and to the very integrity of the nation, and it is vital that those responsible within the UK transport establishment are held to account. They must either demonstrate that my concerns are baseless by providing satisfactory answers to all the 7 key questions that I have posed, and by publishing an Integrated Rail Plan that addresses all my concerns; or they must acknowledge their failures, and stand aside. As professionals whose core obligation is to serve the public interest, they have no alternative.

It is plain that that the failures of the UK high speed rail project are of such gravity that they cannot be allowed to continue. To do so in the face of the overwhelming evidence now available would be not merely unprofessional on the part of those leading the project, but negligent and ultimately criminal, given the critical issues of national interest at stake.

You have pledged to 'follow the data' in your response to the Covid-19 pandemic; and as the UK recovers from Covid-19 and looks to 'build back better', you must do exactly the same with the UK high speed rail project. The priority for best practice, for professional railway network solutions that actually work (and can be shown to do so), has never been greater; second-rate and second-best are simply not good enough.

I would urge you to swiftly investigate the many concerns I have raised, and I would urge you to engage with High Speed UK, the one available technical solution that will bring about the 'one connected network' necessary to deliver your core aims of a rebalanced, greener economy and a better-connected nation.

If you require any further information please do not hesitate to contact me on 07591 959134.

Yours sincerely,

Colin Elliff BSc CEng MICE
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20 Hartley Road, Harrogate, HG2 9DQ

Enclosures:

Appendix A: Connectivity charts showing performance of existing, HS2 & HSUK networks.

Appendix B: HSUK assessment of Integrated Rail Plan performance in Midlands.

Appendix C: HSUK assessment of Integrated Rail Plan performance in Northern Powerhouse.

Appendix D: HSUK submission to Union Connectivity Review.

APPENDIX A

Connectivity Charts showing direct intercity links offered by:

- Existing intercity network (Figure A1);
- HS2, Northern Powerhouse Rail (NPR) & Midlands Rail Hub (MRH) superimposed onto existing intercity network (Figure A2);
- HS2, NPR, MRH & existing network, allowing for likely reductions in existing intercity services (Figure A3);
- HSUK superseding existing intercity network (Figure A4).

The following 18 principal cities are considered, each representing ***major UK conurbations***:

London	***Greater London***	Liverpool	***Merseyside***
Milton Keynes	***M1 Corridor***	Leeds	***West Yorkshire***
Birmingham	***West Midlands***	Darlington	***Teesside***
Leicester	***East Midlands***	Newcastle	***Tyne & Wear***
Nottingham	***East Midlands***	Edinburgh	***Lothian***
Derby	***East Midlands***	Glasgow	***Strathclyde***
Stoke	***Potteries***	Cardiff	***South Wales***
Sheffield	***South Yorkshire***	Bristol	***Avon***
Manchester	***Gr. Manchester***	Cardiff	***South Wales***

Analysis is based upon:

- Existing intercity timetable, see www.nationalrail.co.uk
- Predicted HS2 intercity services, see Annex B : Modelled train service spec, *High Speed Two Phase 2b, Strategic Outline Business Case* (2016)
- Potential intercity service reductions with HS2 in place, see Table 23, pp91-92, *HS2 Regional Economic Impacts* (2013)
- Demonstrator timetable developed for HSUK national network, see www.highspeeduk.co.uk

Each chart shows the available direct links between 18 principal cities which represent the major conurbations of the UK; it also ranks each link by the quality of the train and by the frequency, with all sub-hourly services specifically identified.

Note that 'out of town' parkway stations such as the proposed HS2 East Midlands Interchange at Toton are not accepted as providing direct intercity services to either Nottingham, Derby or Leicester.

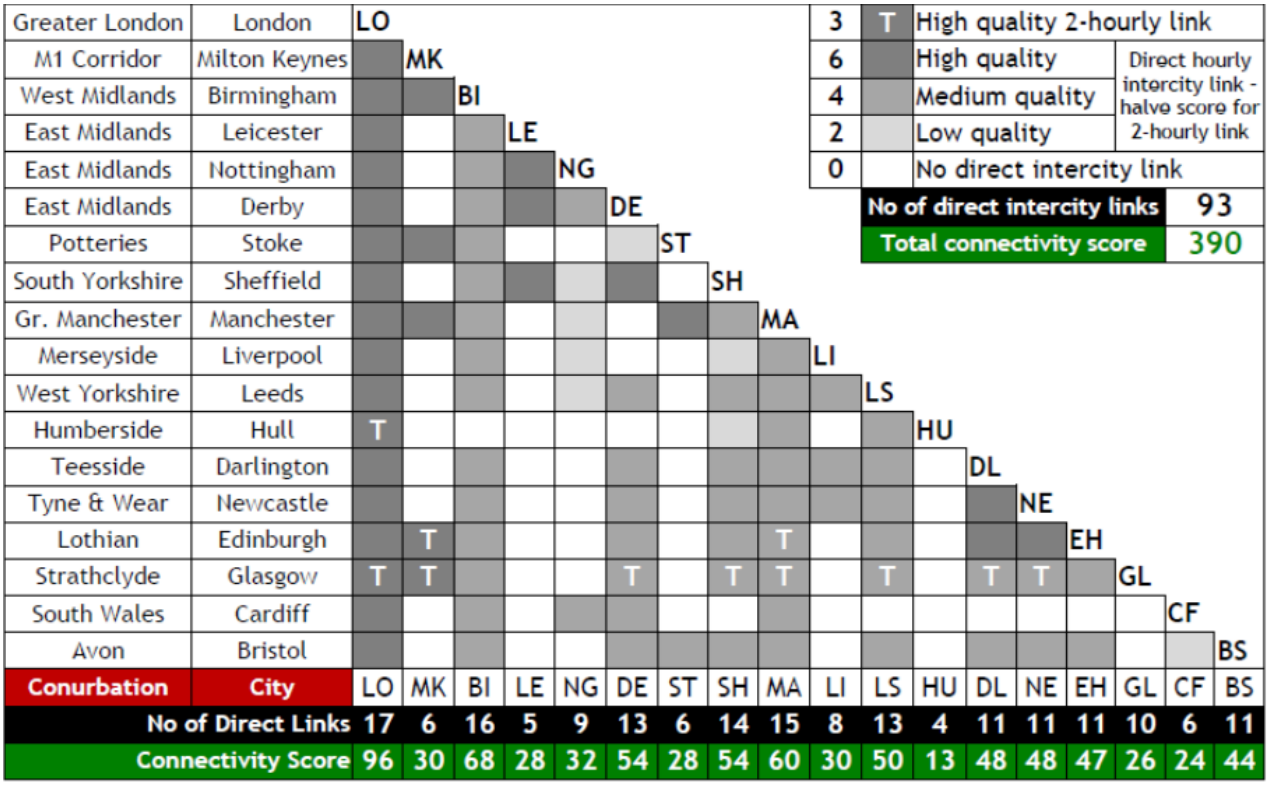


Figure A1 : Direct Intercity Connectivity offered by Existing Intercity Network

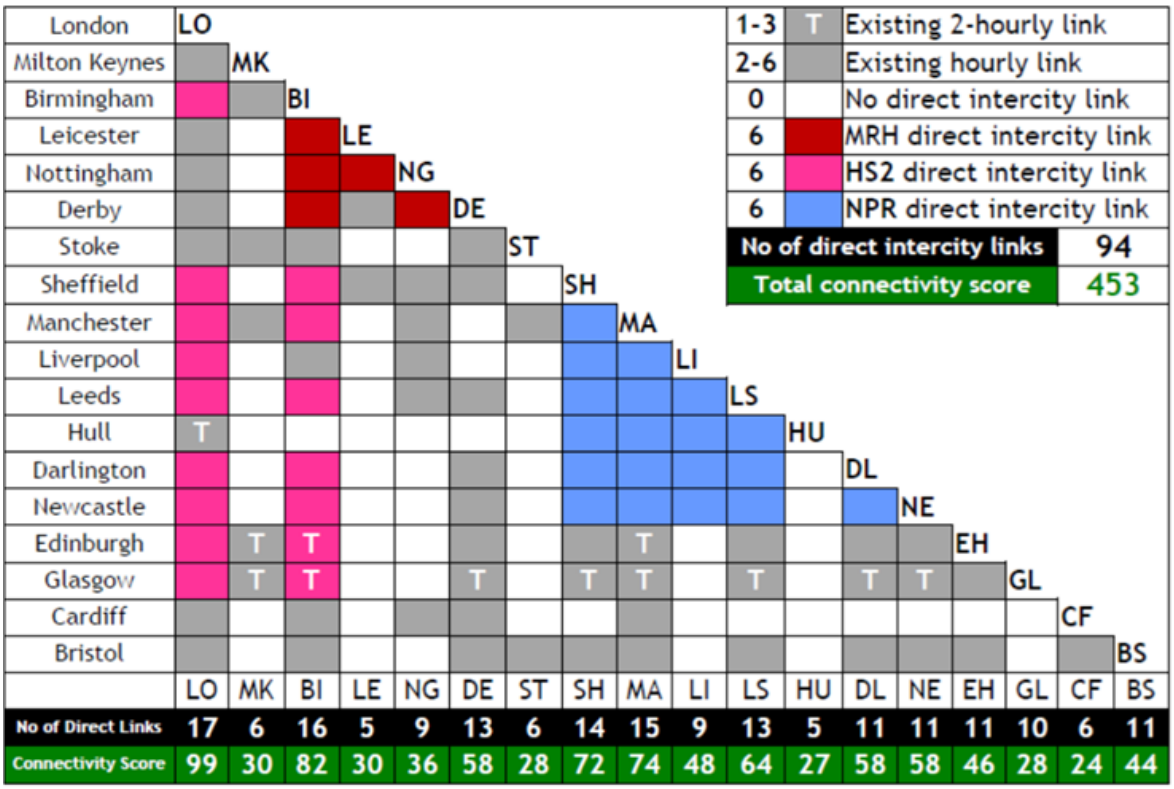


Figure A2 : Direct Intercity Connectivity offered by HS2 (full 'Y-network'), Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH), superimposed onto connectivity of Existing Intercity Network

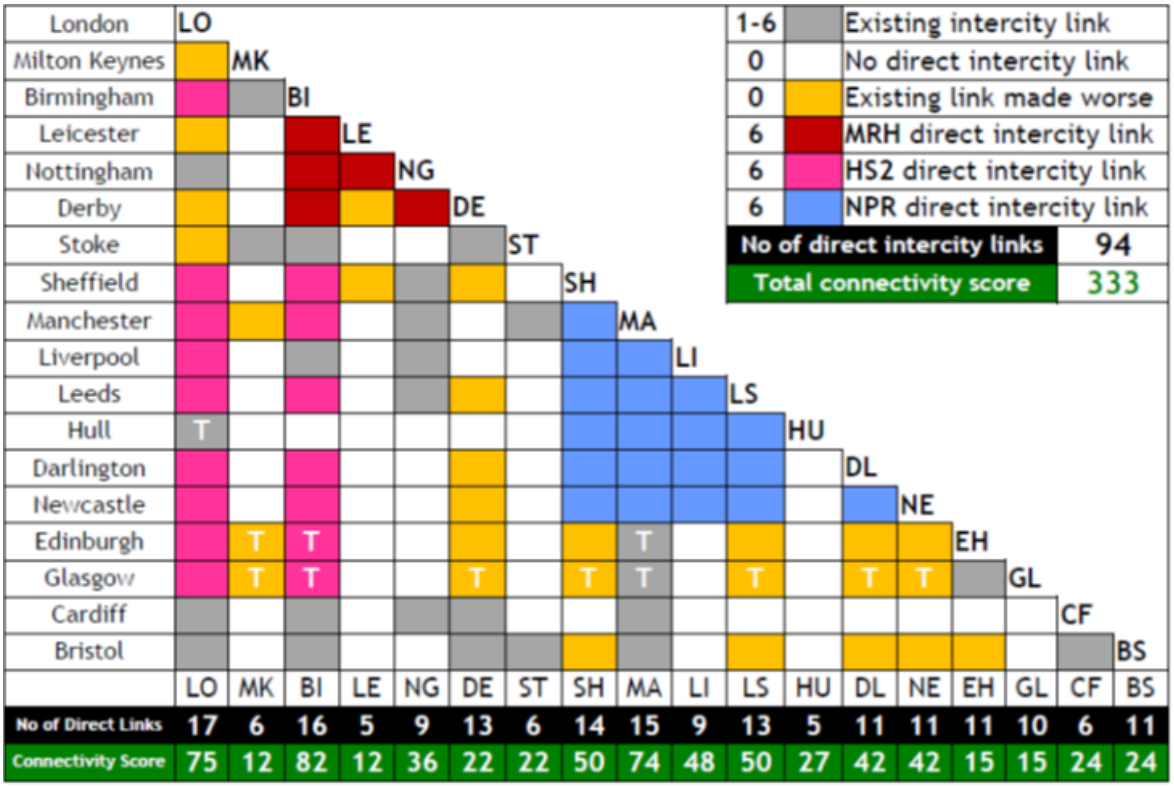


Figure A3 : Direct Intercity Connectivity offered by HS2 (full 'Y-network'), NPR, MRH and Existing Intercity Network, with due allowance for predicted service reductions on existing network

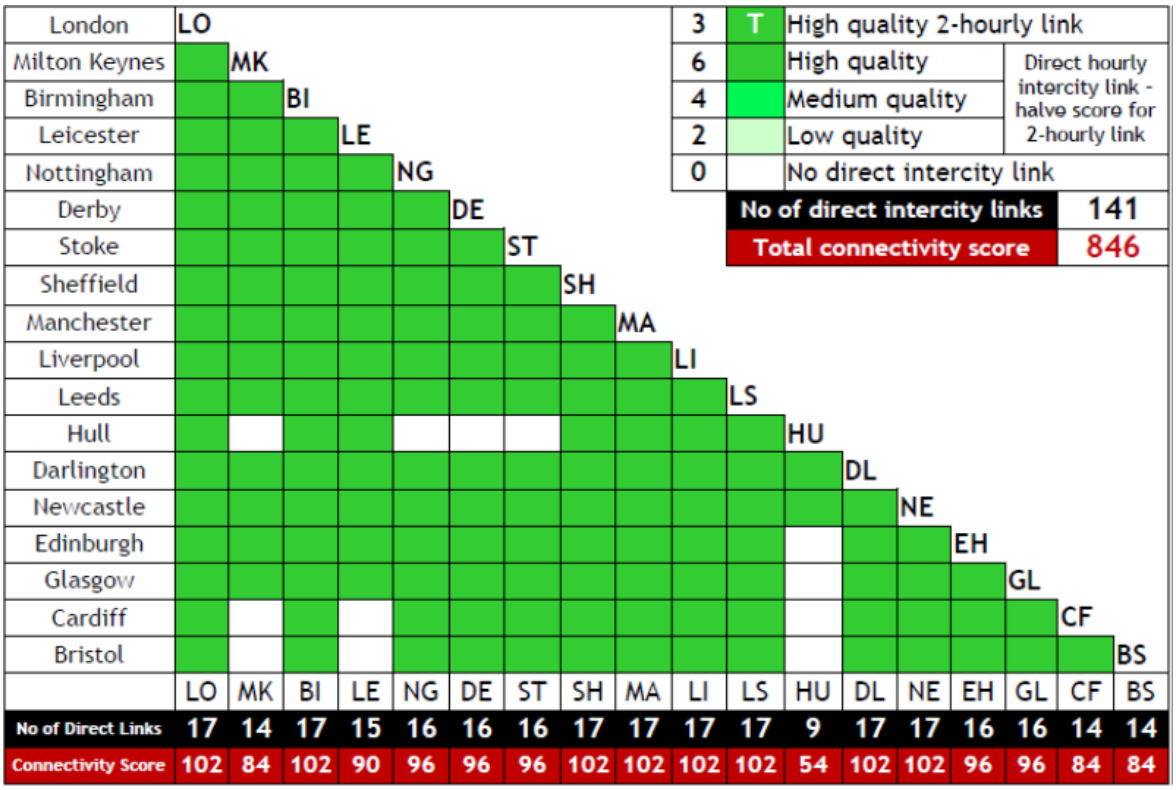


Figure A4 : Direct Intercity Connectivity offered by HSUK Network

APPENDIX B

HSUK assessment of Integrated Rail Plan performance in Midlands

With no definitive design criteria for the Integrated Rail Plan established by the Government, HSUK has set 7 criteria by which schemes should be assessed:

1. Full compliance with any core specification *(note that no specification for journey time, service frequency etc between Midlands cities has been established by any official body).*
2. Direct links between all principal (Midlands) population centres
3. Delivery of maximised journey time reductions.
4. Full integration with local networks at city centre stations.
5. Delivery of step-change capacity gains for local services.
6. Provision of radically enhanced capacity for railfreight.
7. Optimisation of direct links & reductions in journey time to principal population centres across national network.

The following assessment shows HSUK's comprehensive superiority over any local network based upon the official HS2 'Y-network' and Midlands Rail Hub proposals. The assumption is made that the Integrated Rail Plan will stipulate that these proposals are implemented in full; any scope reductions in either scheme (for instance likely curtailment of the HS2 Phase 2b 'Eastern Arm') will further exacerbate the inadequate performance of the official proposals.

It should particularly be noted that HS2 as currently schemed provides no direct links whatsoever between Midlands cities. Note that 'out of town' parkway stations such as the proposed HS2 East Midlands Interchange at Toton are not accepted as providing direct intercity services to either Nottingham, Derby or Leicester.

Further information on the performances of HS2 and HSUK as national propositions is given in Appendix D, see Figures 4.1, 4.2, 4.3, 7.1 and 7.2.

Midlands Rail Hub & HS2:

Are they the network that Midlanders need?

Do they deliver the Integrated Rail Plan?

and… Can they meet the HSUK Challenge?

A study by **Colin Elliff BSc CEng MICE**

Hold this thought…

- The HS2 project can only be justified if it results in an improved national railway network, offering step-change enhancements in capacity and connectivity.
- This improved national network is vital to deliver the HS2 promises of economic benefit, regional rebalancing and reductions in CO_2 emissions, and to build back better after the COVID-19 pandemic.
- HS2 cannot be an end in itself.

A.01

Executive Summary - 1

1. The Midlands Rail Hub (NPR) initiative is vital to creating the enhanced transport network in the Midlands that is necessary:
   - to spur the economic development of the Midlands Engine;
   - to meet the Government's 'levelling up' agenda;
   - to deliver step-change CO_2 reductions in line with 'net zero' commitments;
   - to 'build back better' after the COVID-19 pandemic.
2. This demands not any rail network, but the best possible railway network, delivering the greatest possible connectivity and capacity between the principal cities of the Midlands.

A.02

Executive Summary - 2

3. This study defines 6 core performance requirements of an enhanced rail network for the Midlands Engine:
   - direct intercity links between all principal population centres;
   - step-change journey time reductions across Midlands network;
   - city centre stations for full local/intercity integration;
   - step-change capacity increase for local services;
   - harmonisation with a parallel strategy for regional railfreight;
   - optimised intercity links to other major UK population centres.
4. This study reveals for the first time how a future UK rail network including HS2 & Midlands Rail Hub would perform against the 6 performance requirements listed above.

A.03

Executive Summary - 3

5. This study then contrasts MRH's & HS2's combined performance against that of the Midlands Ring/HSUK Exemplar Alternative.
6. On all comparators, Midlands Ring vastly outperforms MRH/HS2.
7. MRH's failure can be attributed to HS2's lack of integration with the existing network, offering no links between Midlands cities.
8. This leaves MRH as the only intervention to improve Midlands links.
9. By contrast Midlands Ring's design as an integrated national inter-city network, independent of HS2, gives far superior performance.
10. HS2's total lack of integration effectively sabotages both Midlands Rail Hub and the Government's Integrated Rail Plan.
11. Only the fully integrated Midlands Ring can deliver.

A.04

Contents

A.01 Exec Summary/Contents
B.01 Development of MRH
C.01 MRH – Does it Work?
D.01 HSUK Exemplar Alternative
E.01 Compliance with core spec?
F.01 Comprehensive direct links?
G.01 Step-change journey time reductions?
H.01 MRH/HSUK city proposals…
I.01 M1 Corridor cities
J.01 Birmingham
K.01 Black Country
L.01 Stoke/Potteries
M.01 East Midlands cities
N.01 Midlands Railfreight?
P.01 Links to other UK regions?
Q.01 Conclusions
R.01 Integrated Rail Plan

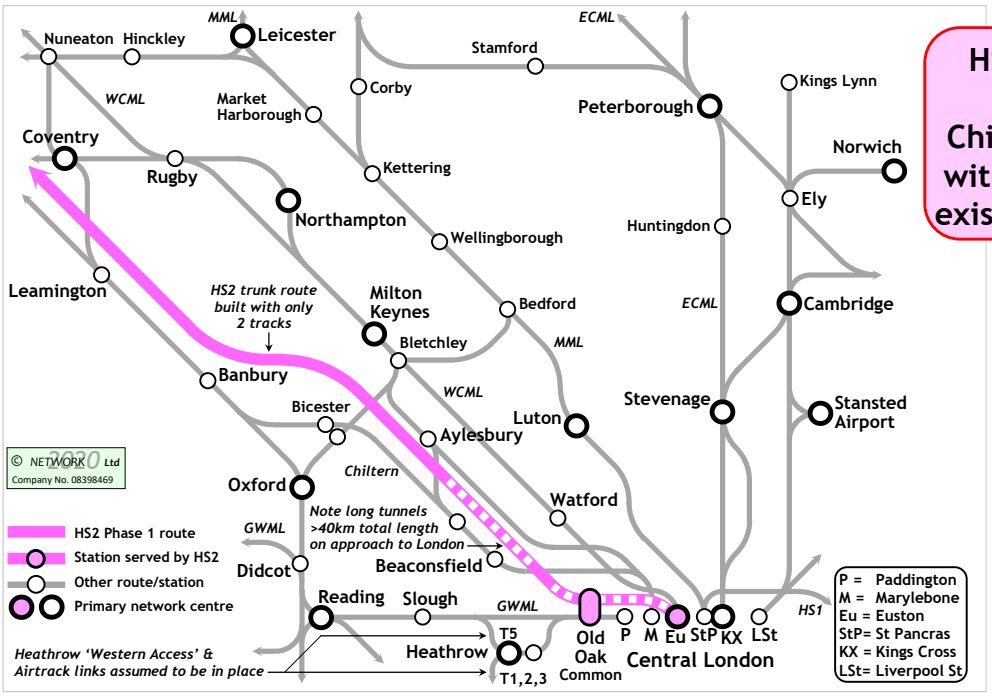
A.05

MRH Development

HSUK

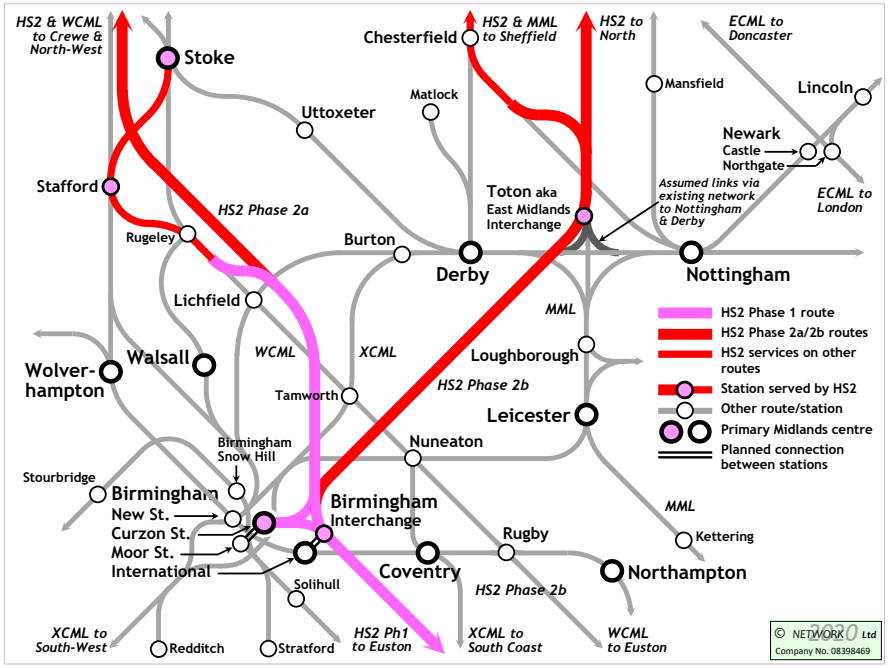
1. 2009 – HS2 project launched, with basic remit for new London – West Midlands high speed line.
2. 2010 – HS2 concept of national Y-network defined, with Ph1 London-West Mids stem splitting into Ph2a route to North-West and Ph2b route to Yorks.
3. 2012 - Ph2a and Ph2b routes confirmed. *Note no links created by HS2 between Midlands cities.*
   See Slide B.03

B.01



HS2 Phase 1 route via Chilterns AONB with no links to existing network

B.02



HS2 Phase 2a/b developed with no thought for links between Midlands cities

B.03

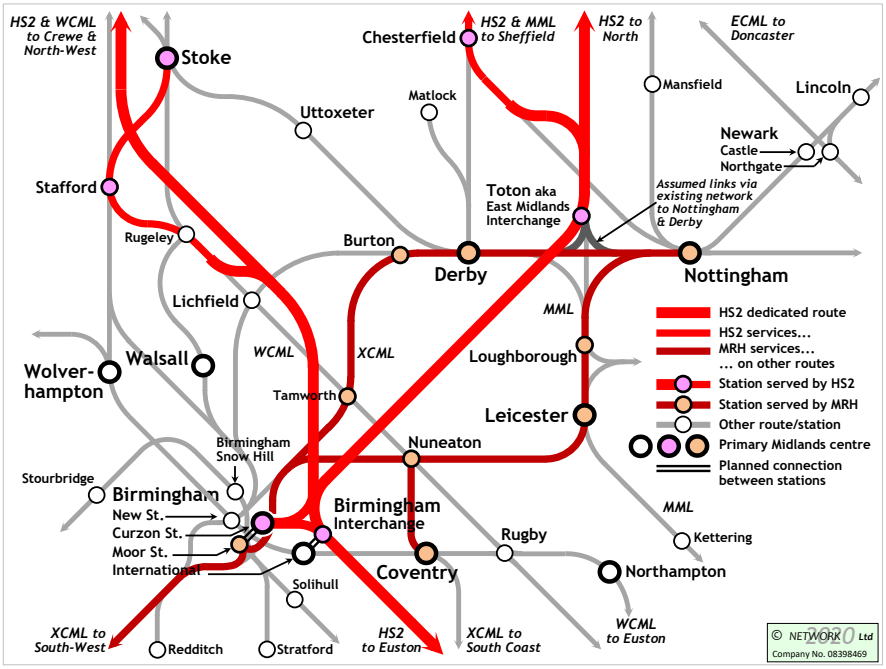
MRH Development

HSUK

4. 2015 – Midlands Connect (MC) established to develop the transport infrastructure necessary to boost the economy of the Midlands.
5. 2019 – MC's Midlands Rail Hub initiative published, proposing upgrades of key intercity routes between West Midlands and East Midlands.

See Slide B.05

B.04



MRH Scheme based upon established HS2 scheme

B.05

MRH – Further Steps

6. End of 2020 – Government due to publish 'Integrated Rail Plan for whole GB network' – *a key recommendation of Oakervee Review of HS2 project*. MRH & HS2 key elements of Integrated Rail Plan.
7. August 2021 - So far, no Integrated Rail Plan.

B.06

MRH: Does it Work?

Comprehensive review of Midlands Connect outputs indicates:

- No evidence of definitive technical proposals for MRH routes or stations *(compare with HS2 progress!)*
- No evidence that MC has adopted any structured approach to developing MRH as an optimised railway network. *Note that exactly the same is true of HS2 – no consideration of national network.*

C.01

Nevertheless…

Sufficient information exists in MC's and HS2 Ltd's technical outputs to:

- Assess MRH's likely improvements in intercity journey times & direct intercity links;
- Determine MRH's overall performance as a railway network interlinking the principal cities of the Midlands Engine.

C.02

Primary Info Source 1

High Speed Rail : Cm7827

HMG/DfT (March 2010)

- This document set out the Government's plan for a Y-shaped 'network' of high speed lines, with a the Phase 1 London-West Midlands stem splitting into:
  - Phase 2a to the North-West; and
  - Phase 2b to East Midlands & Yorkshire.

See Slides B.02 & B.03.

C.03

Primary Info Source 2a

Midlands Rail Hub:

The Case for Transformational Investment in the Region's Rail Network

Midlands Connect (June 2019)

- This document set out the Midlands Rail Hub programme of improved rail links, primarily between East and West Midlands.

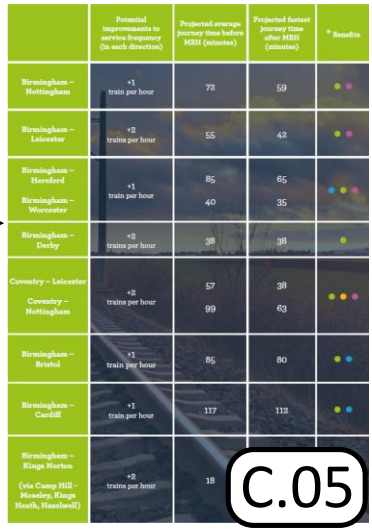
See Slide B.05

C.04

Primary Info Source 2b

Midlands Rail Hub: *The Case for Transformational Investment in the Region's Rail Network*
Midlands Connect (June 2019)

- Proposed journey times and service frequencies shown on Page 11 →
- Proposed routes shown on Page 13 →



	Potential improvements to service frequency (in each direction)	Projected average journey time before MRH (minutes)	Projected fastest journey time after MRH (minutes)	* Benefits
Birmingham – Nottingham	+1 train per hour	72	59	
Birmingham – Leicester	+2 trains per hour	55	42	
Birmingham – Hereford Birmingham – Worcester	+1 train per hour	85 40	65 35	
Birmingham – Derby	+2 trains per hour	38	38	
Coventry – Leicester Coventry – Nottingham	+2 trains per hour	57 99	38 63	
Birmingham – Bristol	+1 train per hour	85	80	
Birmingham – Cardiff	+1 train per hour	117	112	
Birmingham – Kings Norton (via Camp Hill - Moseley, Kings Heath, Hazelwell)	+2 trains per hour	18		

C.05

Remember…

It cannot be disputed that…

- To deliver the greatest possible economic and environmental benefits, the Midlands Engine needs the best possible railway network, providing the greatest possible enhancements in connectivity and capacity.

C.06

Remember…

It also cannot be disputed that…

- Any proposed 'MRH network' must be designed to deliver optimum performance as a network.
- This cannot be left to chance – it is no good designing HS2's high speed lines in isolation from the existing railway system, and then hoping that MRH will deliver the required connectivity.

C.07

Key Network Objectives

An ideal Midlands Engine rail network should…

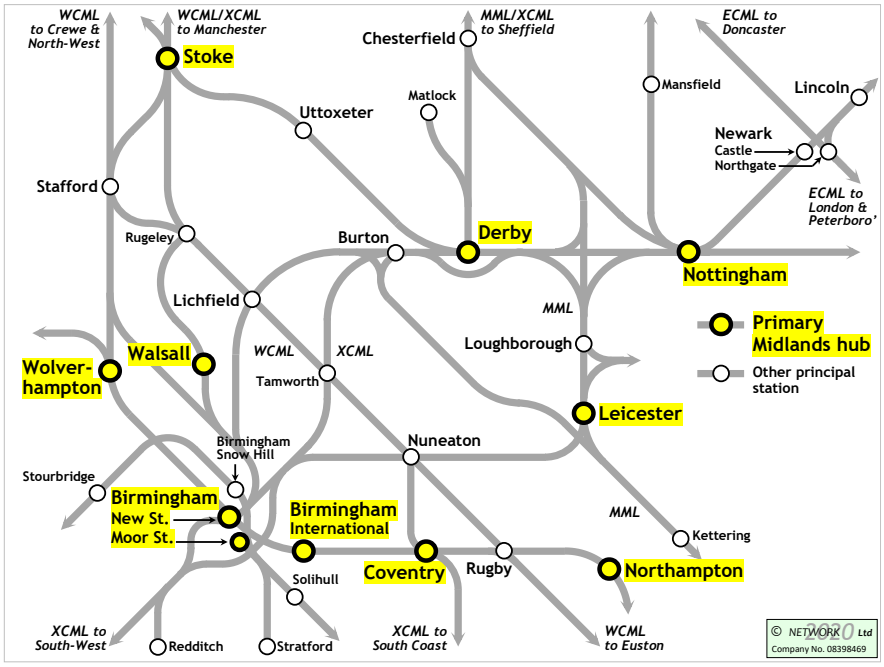
1. Comply fully with any core specification.
2. Directly interlink all principal Midlands population centres.
3. Deliver maximised journey time reductions.
4. Integrate fully with local networks at city centre stations.
5. Deliver step-change capacity gains for local services.
6. Provide radically enhanced capacity for railfreight.
7. Optimise direct links & reductions in journey time to principal population centres across national network.

C.08

10 Hubs Considered in HSUK Network Analysis

Northampton		Wolverhampton	
Coventry		Stoke	
B'ham Airport		Derby	
Birmingham		Nottingham	
Walsall		Leicester	

C.09



9 Cities & 1 Airport considered in HSUK network analysis

C.10

Basis of Analysis

- Any judgment on network performance can only be made in the context of the performance of the existing network.
- Primary problem:
  - West Midlands served by WCML
  - East Midlands served by MML
  - All West Mids-East Mids links focussed upon Birmingham New Street

C.11

Existing intercity network in West & East Midlands

C.12

Existing Network Links

	NN	CV	BHX	BI	WS	WV	ST	DE	NG	LE
Northampton										
Coventry										
B'ham Airport										
Birmingham										
Walsall										
Wolverhampton										
Stoke										
Derby										
Nottingham										
Leicester										
No of Direct Links	5	5	5	9	2	6	6	4	3	3

High quality
Medium quality
Low quality
No direct link

Direct hourly intercity link

No. of direct links 24

Existing network offers **24** direct intercity links out of **45** possible.

53% Network efficiency

C.13

The High Speed UK Exemplar Alternative

- A properly informed judgement on MRH's performance as an intercity network, and on its worth as a public infrastructure project, can only be made through rigorous comparison with an 'Exemplar Alternative'.
- High Speed UK provides this Exemplar Alternative.

D.01

The HSUK Alternative

- Unlike MRH or HS2, Midlands Ring/HSUK has been designed from the outset as a national intercity network, with the basic aim of establishing frequent and direct intercity links between all major UK cities.
- The HSUK design is supported by detailed design (at 1:25,000 scale) of over 1,000km of new, upgraded and restored railway. This has in turn allowed detailed estimation of construction cost, and calculation of journey times on all intercity routes.

D.02

Midlands Ring & HSUK

- The elements of High Speed UK in the Midlands Engine region are presented as the 'Midlands Ring'.
- The Midlands Ring has the same fundamental aim as Midlands Rail Hub (MRH) – to interconnect the major cities of the Midlands, and hence promote economic growth.
- The detailed design supporting Midlands Ring allows rigorous comparisons to be made with MRH on a wide range of technical criteria.

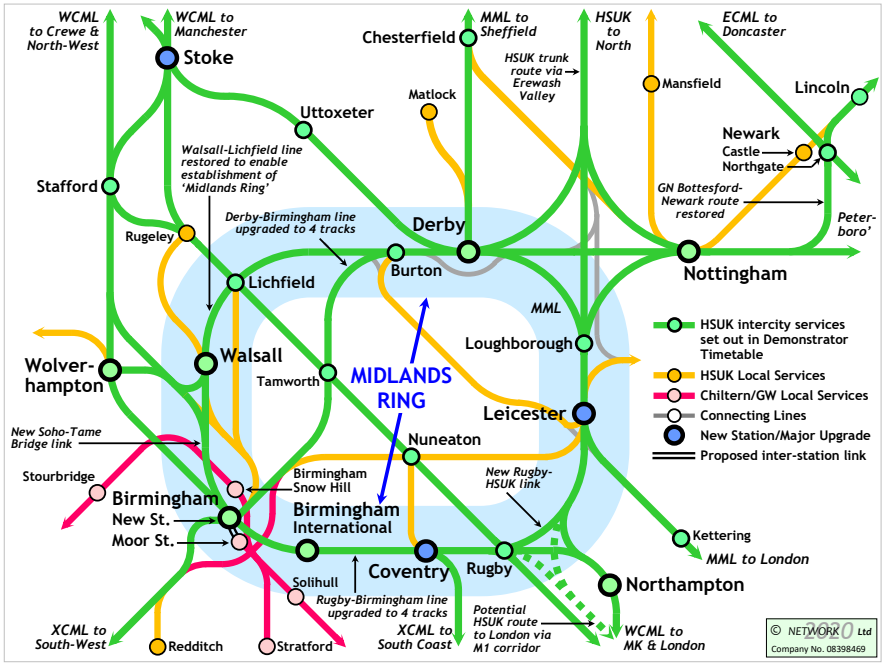
D.03

Midlands Ring Services

HSUK

- High Speed UK/Midlands Ring intercity services will extend to all major population centres in the Midlands Engine/M1 Corridor.
- These services will be fully integrated with a wider network of local services.
- Routeing via M1 Corridor vital for HSUK's comprehensive coverage & full integration.

D.04



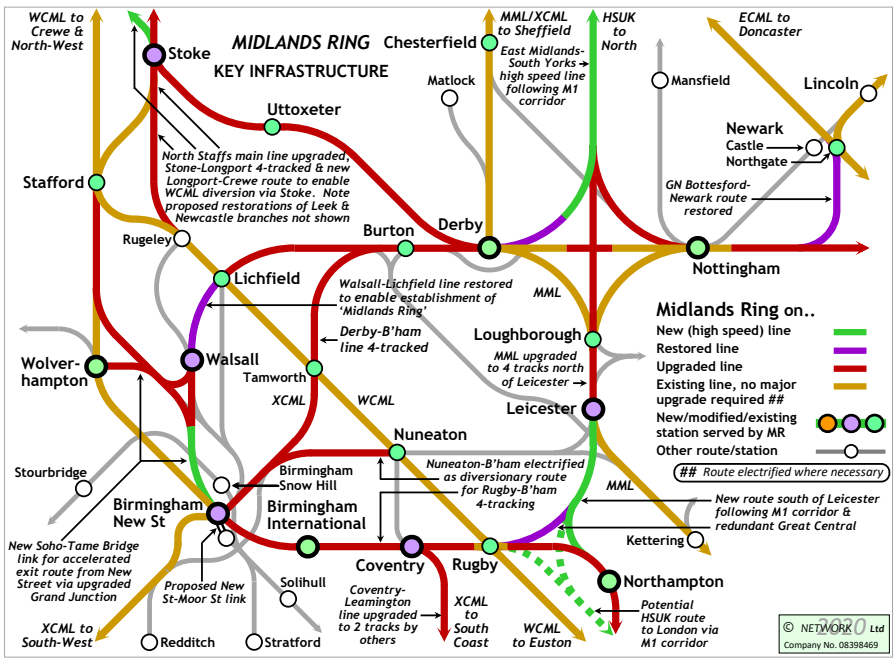
Midlands Ring Intercity Network in Midlands Engine

D.05

Midlands Ring Routes

- High Speed UK/Midlands Ring services will operate on a blend of:
  - New-build routes;
  - Upgraded existing routes;
  - Restored abandoned routes.
- This is harmonious with wider initiatives to:
  - Create a dedicated north-south freight route; and
  - Electrify most Midlands rail routes.
- Vastly reduced env. impact along M1 Corridor.

D.06



Midlands Ring Proposed Infrastructure in Midlands Engine

Proposed north-south freight route not shown

D.07

Network Aim 1

1. Full compliance with core specification for journey time & service frequency??

E.01

Compliance with Spec for Journey Time & Service Frequency??

No core specification has ever been issued for fundamental intercity connectivity between the principal population centres of the West and East Midlands.

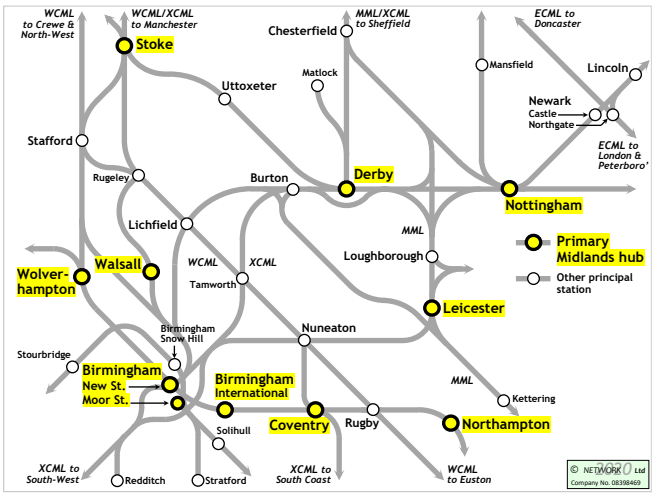
E.02

Network Aim 2

2. Comprehensive direct links between principal centres of Midlands Engine

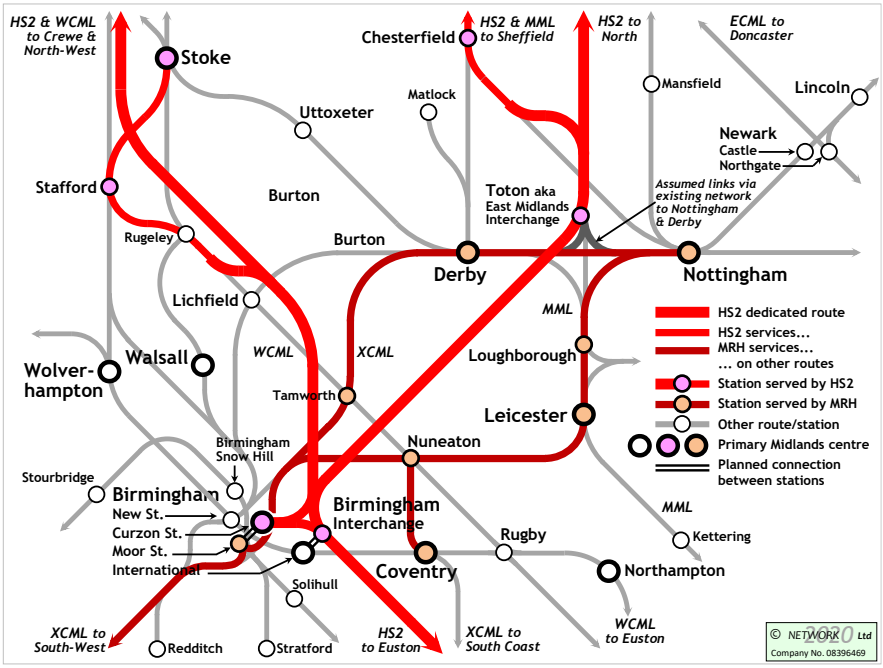
F.01

Direct Links??



- 9 cities + 1 airport considered in connectivity analysis of rail network of the Midlands Engine
- 9 possible links from 10 centres
- 45 links in total

F.02



MRH Scheme based upon established HS2 scheme

F.03

Direct Links via MRH

HSUK

	NN	CV	BHX	BI	WS	WV	ST	DE	NG	LE
Northampton	NN									
Coventry		CV								
B'ham Airport			BHX							
Birmingham				BI						
Walsall					WS					
Wolverhampton						WV				
Stoke							ST			
Derby								DE		
Nottingham									NG	
Leicester										LE
No of Direct Links	0	2	0	3	0	0	0	2	4	3

0	HS2 direct intercity link
7	MRH direct intercity link
38	Existing intercity link
	No direct intercity link
No. of direct links	7

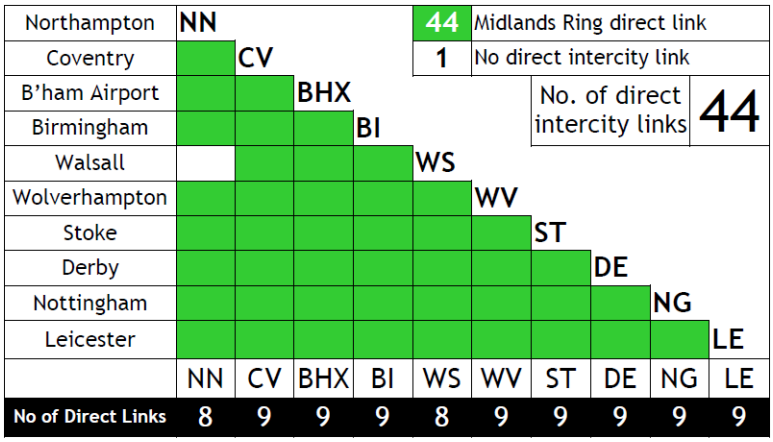
MRH offers **7** improved direct intercity links out of **45** possible.

HS2 offers **nothing**.

16% Network efficiency

F.04

Midlands Ring Direct Links



Midlands Ring offers **44** improved direct intercity links out of **45** possible.

98% Network efficiency

F.05

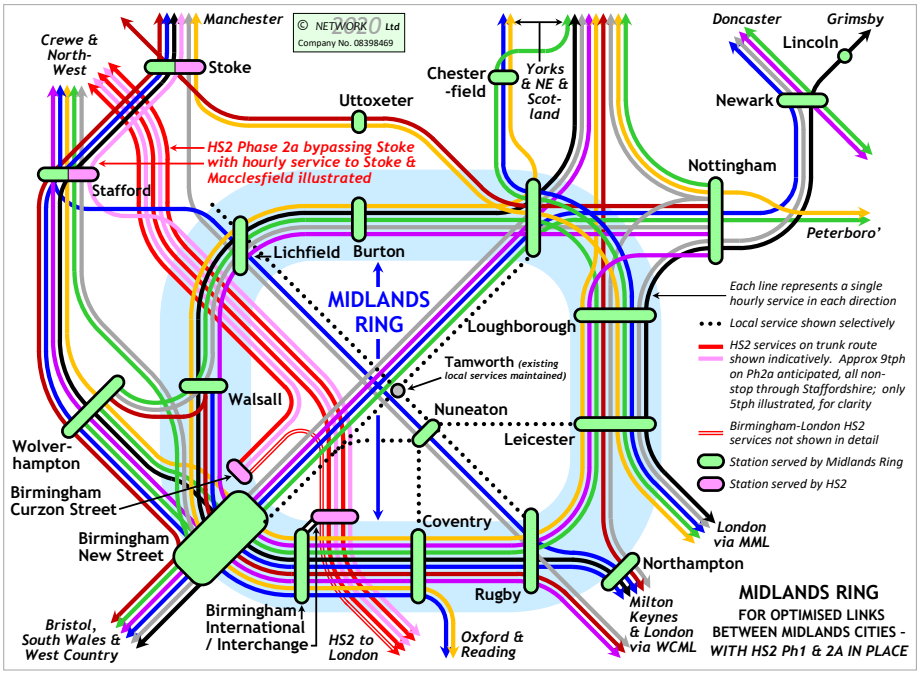
Midlands Ring & HSUK

Midlands Ring links will be achieved independent of HS2 rollout.

- Midlands Ring + HS2 Ph1 & 2a – Slide F.07
- Midlands Ring + HS2 Ph1 only – Slide F.08
- Midlands Ring + wider HSUK project – Slides F.09/F.10

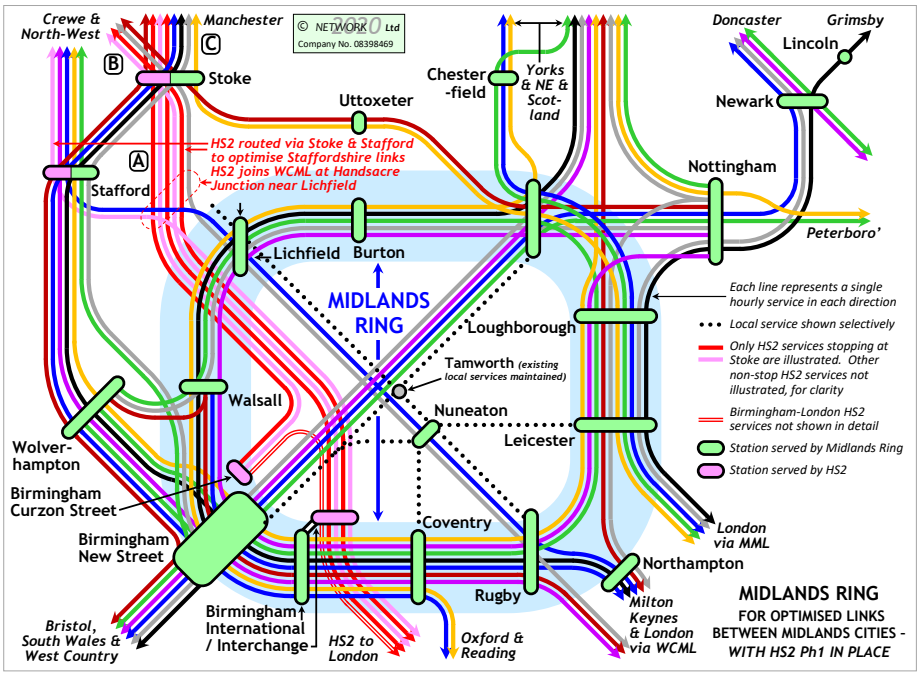
F.06

Midlands Ring + HS2 Ph1/2a

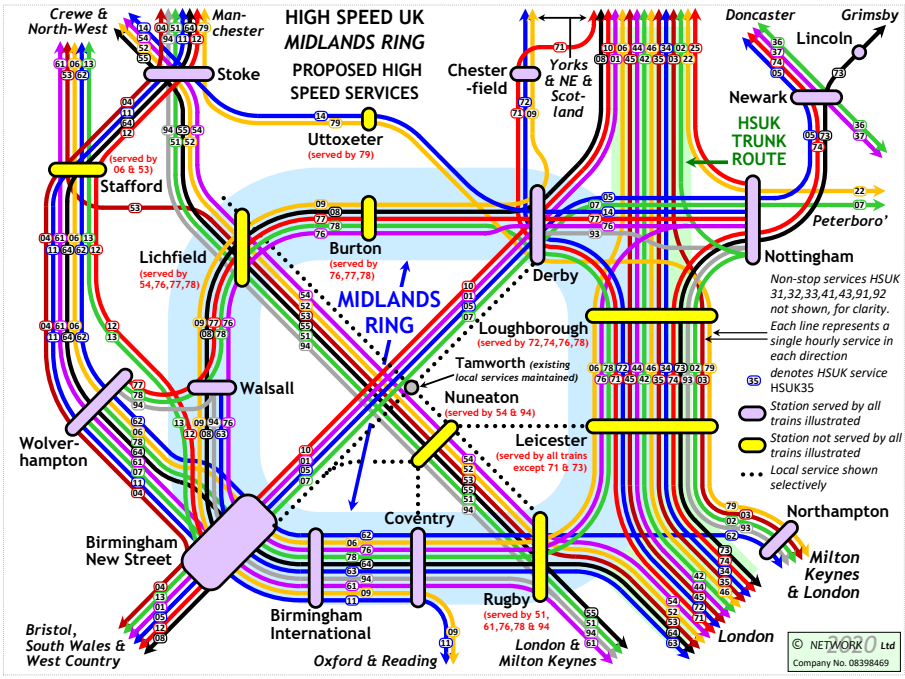


F.07

Midlands Ring + HS2 Ph1 only

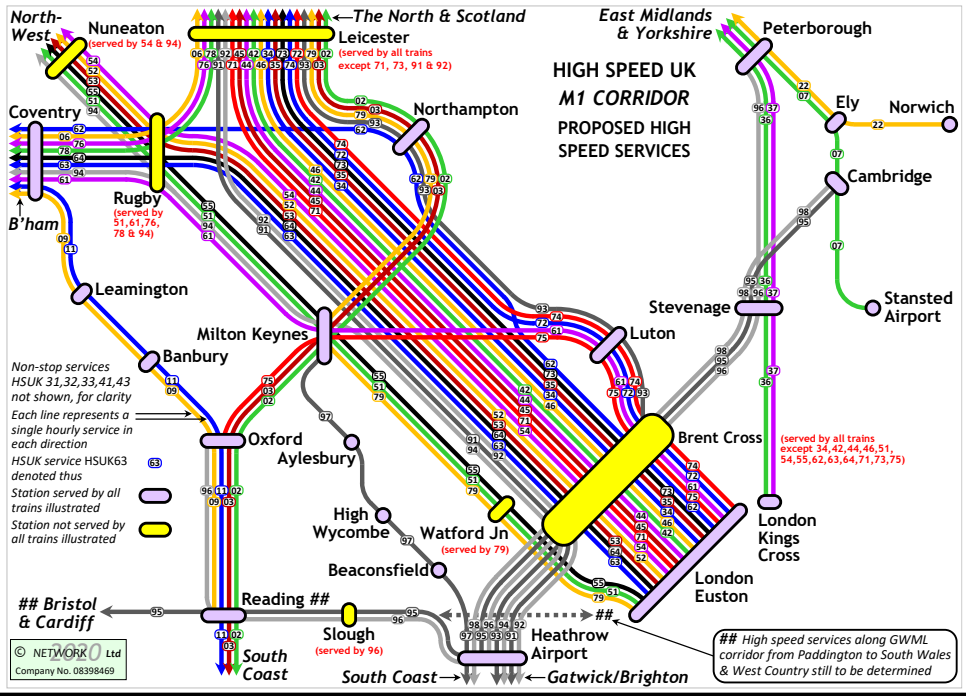


F.08



Midlands Ring + HSUK national

F.09



HSUK Designed Service Pattern

F.10

Network Aim 3

3. Step-change journey time reductions on intercity routes within Midlands Engine

G.01

Journey Time Calcs

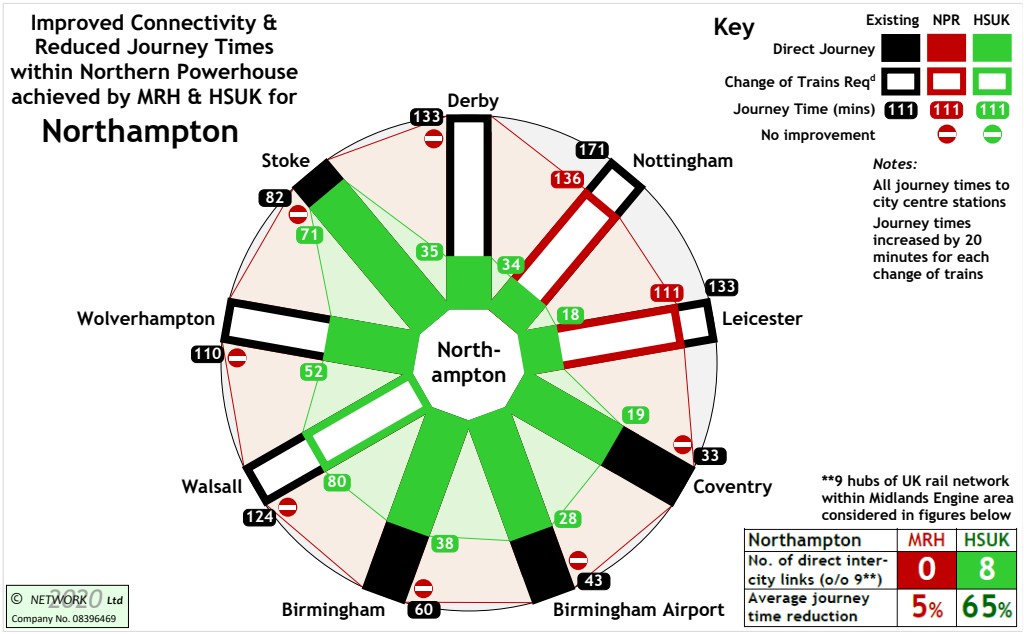
- Comprehensive route design of Midlands Ring's new-build, upgraded and restored lines allows direct journey times to be calculated for all the proposed services illustrated in Slide F.05.
- MRH direct journey times are based on the services illustrated in Slide F.03 and journey times published by Midlands Connect.
- Times for journeys requiring a change of trains include an allowance of 20 minutes to reflect the 'deterrent effect' of changing trains.
- Midlands Ring, MRH and existing journey times to 10 principal West and East Midlands centres are presented on the following slides.

G.02

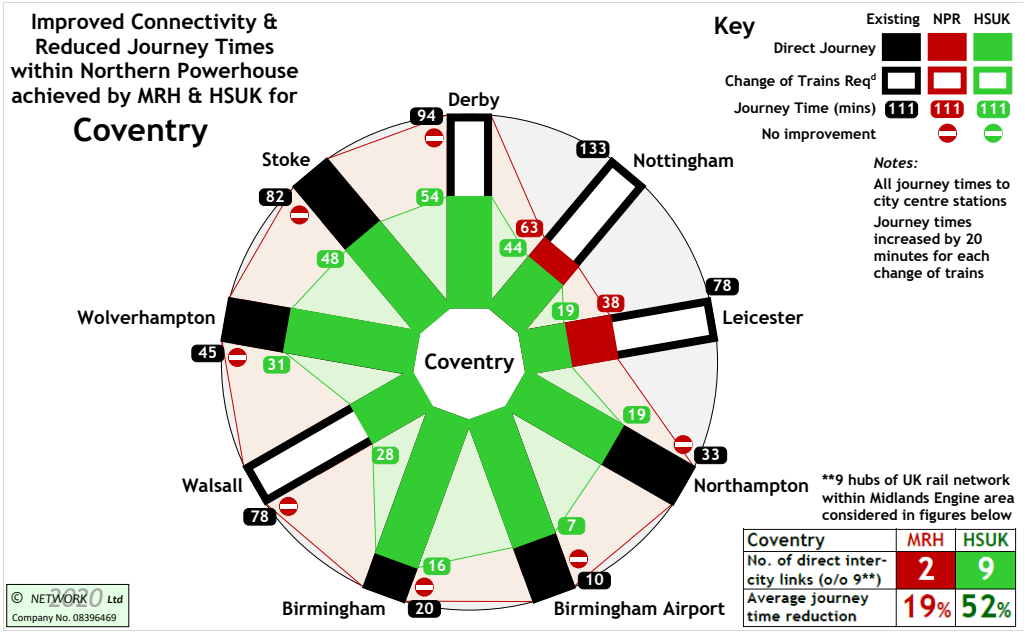
Journey Time Reductions Index to City Data

Northampton	G.04	Wolverhampton	G.09
Coventry	G.05	Stoke	G.10
B'ham Airport	G.06	Derby	G.11
Birmingham	G.07	Nottingham	G.12
Walsall	G.08	Leicester	G.13

G.03



G.04


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by MRH & HSUK for
Coventry
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Derby
Nottingham
Leicester
Northampton
Birmingham Airport
Coventry
Birmingham
Walsall
Wolverhampton
Stoke
94
133
78
33
10
20
78
45
82
54
63
44
38
19
19
28
7
16
31
48
**9 hubs of UK rail network within Midlands Engine area considered in figures below
Coventry | MRH | HSUK
No. of direct inter-city links (o/o 9**) | 2 | 9
Average journey time reduction | 19% | 52%
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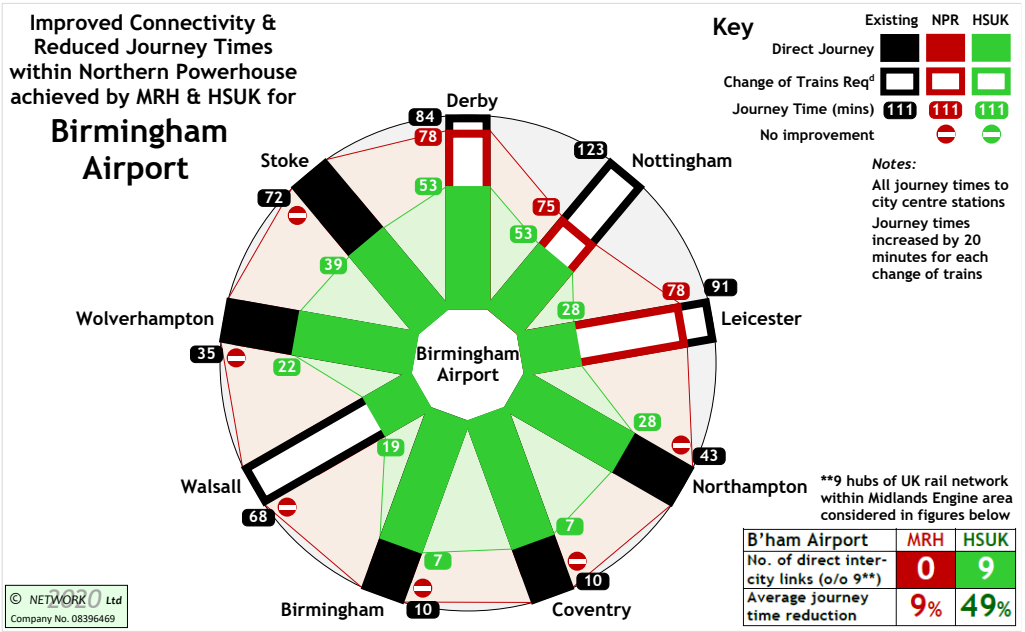
G.05


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by MRH & HSUK for
Birmingham Airport
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Derby
Nottingham
Leicester
Northampton
Coventry
Birmingham
Walsall
Wolverhampton
Stoke
84
123
91
43
10
10
68
35
72
78
53
75
53
39
78
28
28
19
7
7
22
**9 hubs of UK rail network within Midlands Engine area considered in figures below
B'ham Airport | MRH | HSUK
No. of direct inter-city links (o/o 9**) | 0 | 9
Average journey time reduction | 9% | 49%
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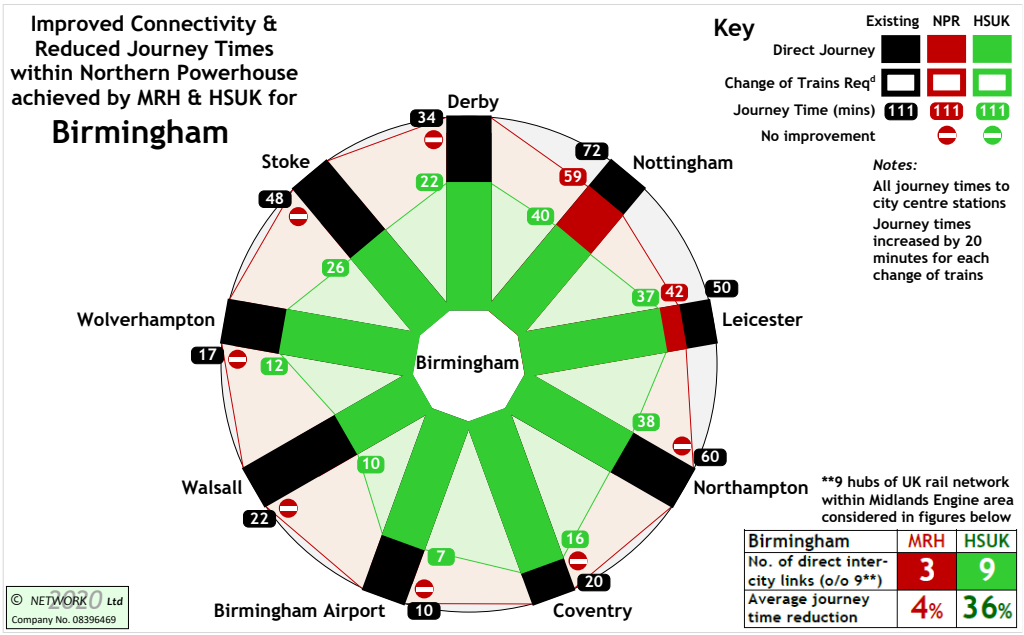
G.06


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by MRH & HSUK for
Birmingham
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Derby
Nottingham
Leicester
Northampton
Coventry
Birmingham Airport
Walsall
Wolverhampton
Stoke
Birmingham
34
72
59
22
40
48
26
37
42
50
17
12
38
60
10
22
16
7
20
10
**9 hubs of UK rail network within Midlands Engine area considered in figures below
Birmingham | MRH | HSUK
No. of direct inter-city links (o/o 9**) | 3 | 9
Average journey time reduction | 4% | 36%
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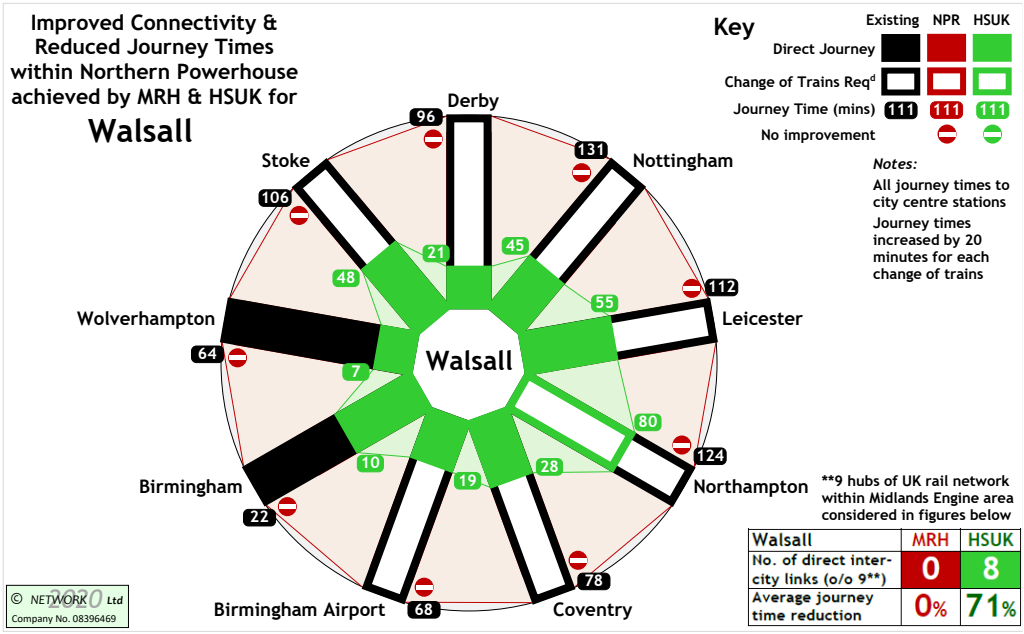
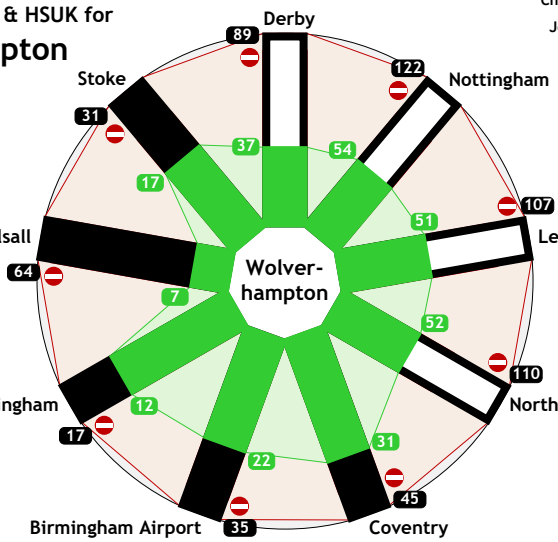
G.07


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by MRH & HSUK for
Walsall
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Derby
Nottingham
Leicester
Northampton
Coventry
Birmingham Airport
Birmingham
Wolverhampton
Stoke
Walsall
96
131
106
21
45
48
55
112
64
7
80
124
10
19
28
22
78
68
**9 hubs of UK rail network within Midlands Engine area considered in figures below
Walsall | MRH | HSUK
No. of direct inter-city links (o/o 9**) | 0 | 8
Average journey time reduction | 0% | 71%
© NETWORK 2020 Ltd
Company No. 08396469
G.08

Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by MRH & HSUK for

Wolverhampton



Key

	Existing	NPR	HSUK
Direct Journey			
Change of Trains Req[d]			
Journey Time (mins)	111	111	111
No improvement			

Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains

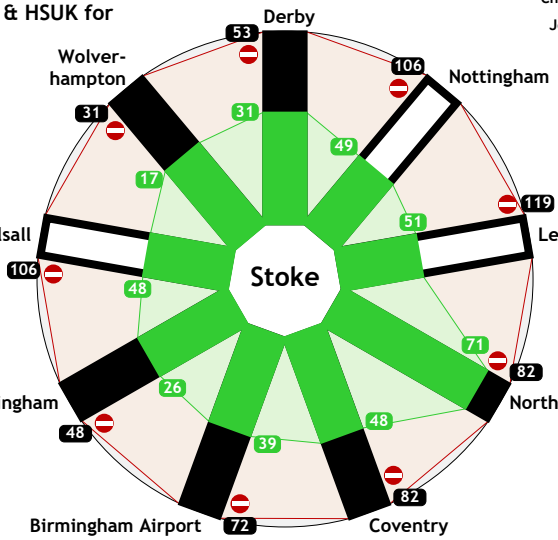
**9 hubs of UK rail network within Midlands Engine area considered in figures below

Wolverhampton	MRH	HSUK
No. of direct inter-city links (o/o 9**)	0	9
Average journey time reduction	0%	63%

G.09

Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by MRH & HSUK for

Stoke



Key

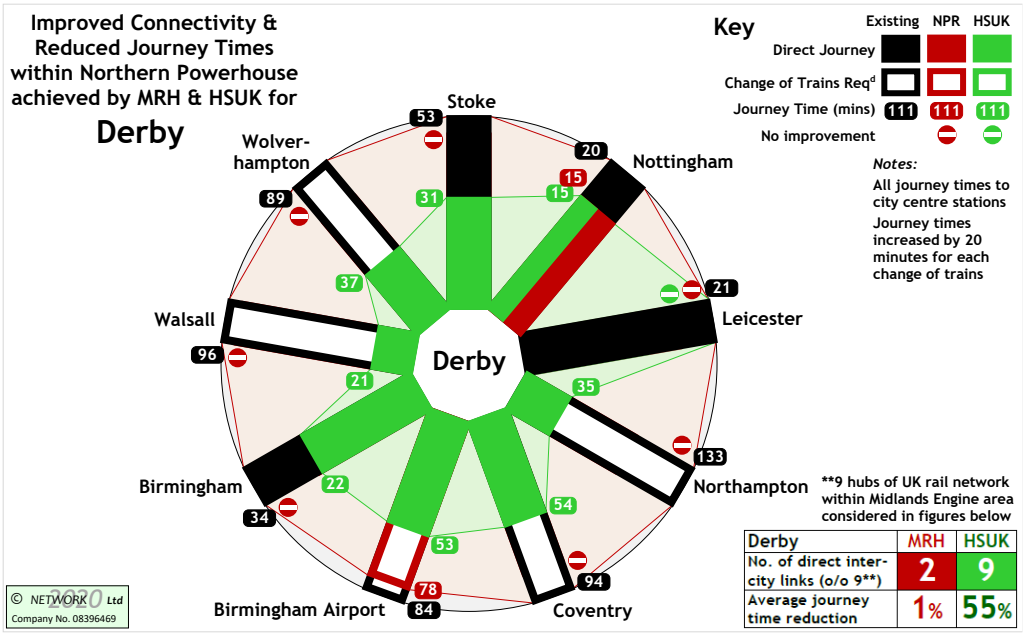
	Existing	NPR	HSUK
Direct Journey			
Change of Trains Req[d]			
Journey Time (mins)	111	111	111
No improvement			

Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains

**9 hubs of UK rail network within Midlands Engine area considered in figures below

Stoke	MRH	HSUK
No. of direct inter-city links (o/o 9**)	0	9
Average journey time reduction	0%	46%

G.10


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by MRH & HSUK for
Derby
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Stoke
Wolver-hampton
Nottingham
Leicester
Walsall
Derby
Northampton
Birmingham
Birmingham Airport
Coventry
53
20
15
15
31
89
37
21
96
21
35
133
22
54
34
53
78
94
84
**9 hubs of UK rail network within Midlands Engine area considered in figures below
Derby | MRH | HSUK
No. of direct inter-city links (o/o 9**) | 2 | 9
Average journey time reduction | 1% | 55%
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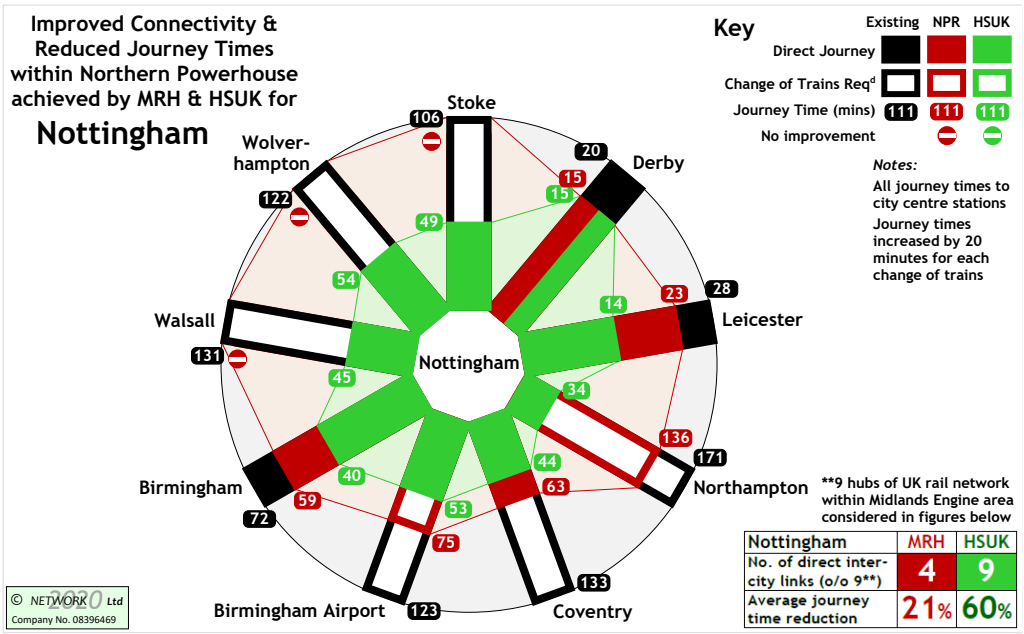
Company No. 08396469
G.11


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by MRH & HSUK for
Nottingham
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Stoke
Wolver-hampton
Derby
Leicester
Walsall
Nottingham
Northampton
Birmingham
Birmingham Airport
Coventry
106
20
15
15
122
49
54
23
28
14
131
45
34
136
171
44
40
63
59
53
72
75
133
123
**9 hubs of UK rail network within Midlands Engine area considered in figures below
Nottingham | MRH | HSUK
No. of direct inter-city links (o/o 9**) | 4 | 9
Average journey time reduction | 21% | 60%
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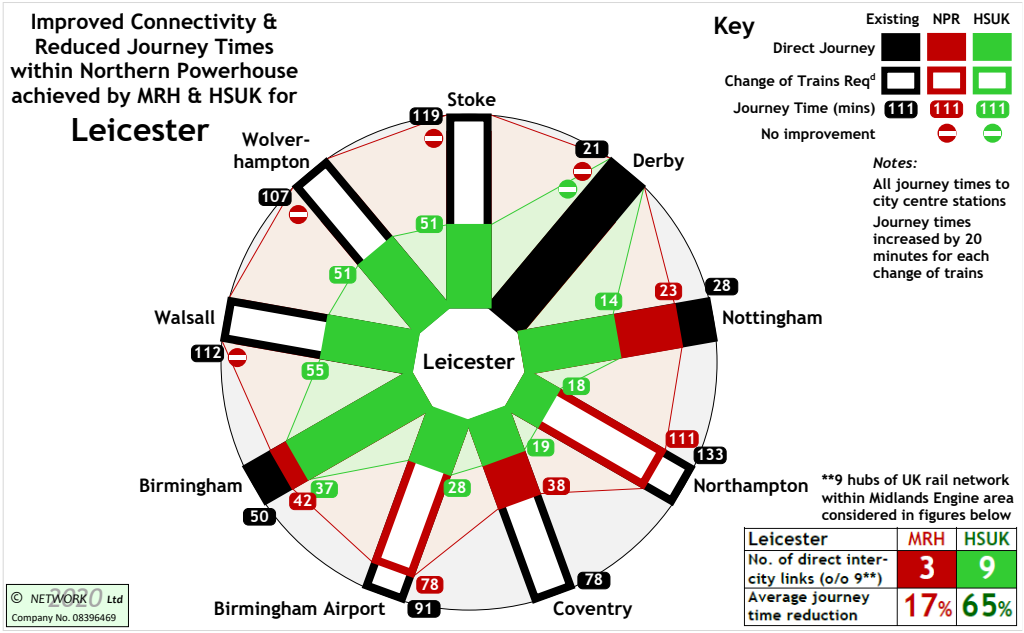
G.12



G.13

Overall Journey Time Reduction Performance HSUK

Averaged across 45 journeys interlinking 10 key Midlands Engine centres:

- MRH achieves 8% average JT reduction
- Midlands Ring achieves 59% average JT reduction

G.14

Network Aims 4 & 5

4. Full integration between high speed and existing networks
5. 'High speed' benefits to all major population centres

H.01

HS2/MRH Schemes for Midlands Engine Cities

No detailed schemes have yet emerged to demonstrate how HS2 and Midlands Rail Hub can be successfully integrated either with each other, or with the wider rail network of the West and East Midlands, to deliver real transport benefits for the people of the Midlands.

H.02

HSUK Schemes for Midlands Engine Cities

Under HSUK/Midlands Ring's fully integrated design approach – including detailed route design and development of the Demonstrator Timetable – schemes have been developed for all major population centres in the Midlands.

H.03

Integration & Capacity Index to City Schemes

Northampton	I.02	Wolverhampton	K.03
Coventry	I.03	Stoke	L.02
B'ham Airport	I.04	Derby	M.02
Birmingham	J.02	Nottingham	M.03
Walsall	K.02	Leicester	M.04

H.04

WCML Corridor

- Northampton I.02
- Coventry I.03
- Birmingham Airport I.04

I.01

Northampton

- HSUK/Midlands Ring will serve Northampton at existing station.
- Northward link to Leicester via HSUK & southward via restored East-West route to Reading and South Coast places Northampton on a new north-south intercity corridor. I/C connectivity transformed.
- No MRH or HS2 services are proposed for Northampton.

I.02

Coventry

- HSUK/Midlands Ring will serve Coventry at its existing station on the WCML route to Birmingham.
- Northward link to HSUK near Rugby will transform Coventry's links to East Midlands, Yorkshire, the North-East and Scotland.
- No HS2 services are proposed for Coventry, and instead major reductions in Coventry's intercity services are likely. MRH will only link Coventry to Leicester & Nottingham.

I.03

Birmingham Airport

- HSUK/Midlands Ring will serve Birmingham Airport at the existing Birmingham International station & deliver direct airport links to all major Midlands centres, also to Yorkshire and the North-West.
- Birmingham-Airport-Rugby route fully 4-tracked.
- No MRH services proposed for Birmingham Airport.
- HS2 services will operate from the nearby Birmingham Interchange via a shuttle link, but provide no direct link to Midlands cities.

I.04

Birmingham

- HS2 in Birmingham J.02
- HSUK in Birmingham J.03
- HSUK proposed works J.04
- HSUK local services J.05

J.01

Birmingham – HS2/MRH

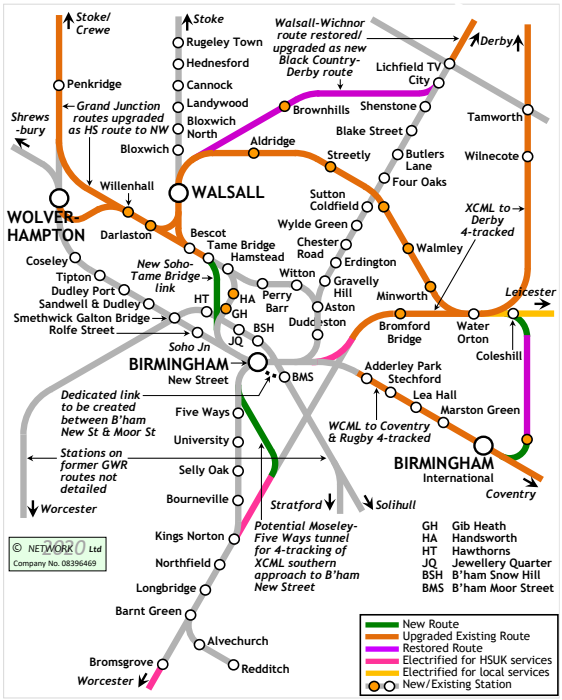
- HS2 will serve Birmingham at the proposed new Birmingham Curzon Street terminus.
- MRH will serve Birmingham at the existing Birmingham Moor Street terminus.
- Both stations remote from New Street, which will remain primary hub for local West Mids services.
- Both stations are termini – therefore both capacity and capability for through routeing (e.g. Cross-Country to South-West) hugely limited.

J.02

Birmingham - HSUK

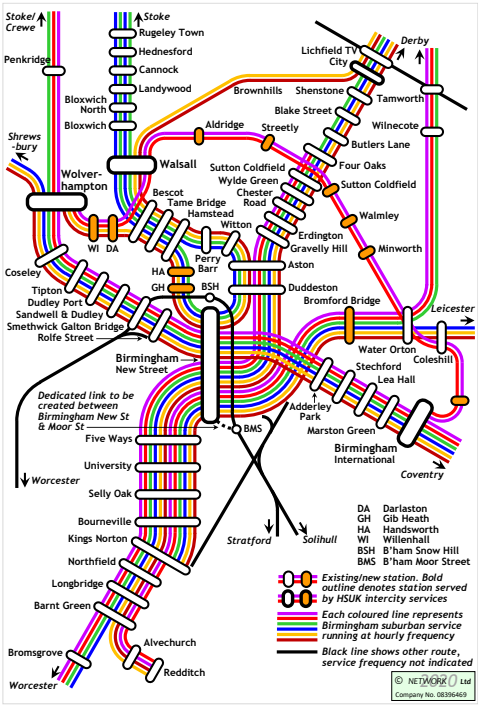
- HSUK/Midlands Ring will serve Birmingham at the existing Birmingham New Street Station.
- Existing 12 platforms have sufficient capacity if termination and reversal of services at New Street can be eliminated.
- Primary constraint on capacity is limited capacity on existing 2-track approach routes to New Street.
- HSUK will 4-track all principal approach routes.
- Proposed travellator link to Moor Street.

J.03



HSUK Scheme for Improved Rail Infrastructure in Birmingham

J.04



HSUK Scheme for Improved Local Services in Birmingham

Illustrated services repeated every 60 minutes

J.05

Black Country

- Walsall K.02
- Wolverhampton K.03

K.01

Walsall

- HSUK/Midlands Ring will serve Walsall at its existing station – currently with only local services.
- With new/upgraded/restored links to Birmingham, Wolverhampton and Derby, Walsall will see its intercity connectivity transformed, both to Midlands cities and nationally.
- No MRH or HS2 services are proposed for Walsall.
- Links to MRH & HS2 will require walking transfer from B'ham New Street to Moor Street.

K.02

Wolverhampton

- HSUK/Midlands Ring will serve Wolverhampton at the existing 'High Level' station.
- Restoration of Walsall-Lichfield route will transform Wolverhampton's links to East Midlands.
- No MRH or HS2 services are proposed for Wolverhampton.
- Links to MRH & HS2 will require walking transfer from Birmingham New Street to Moor Street.

K.03

Potteries

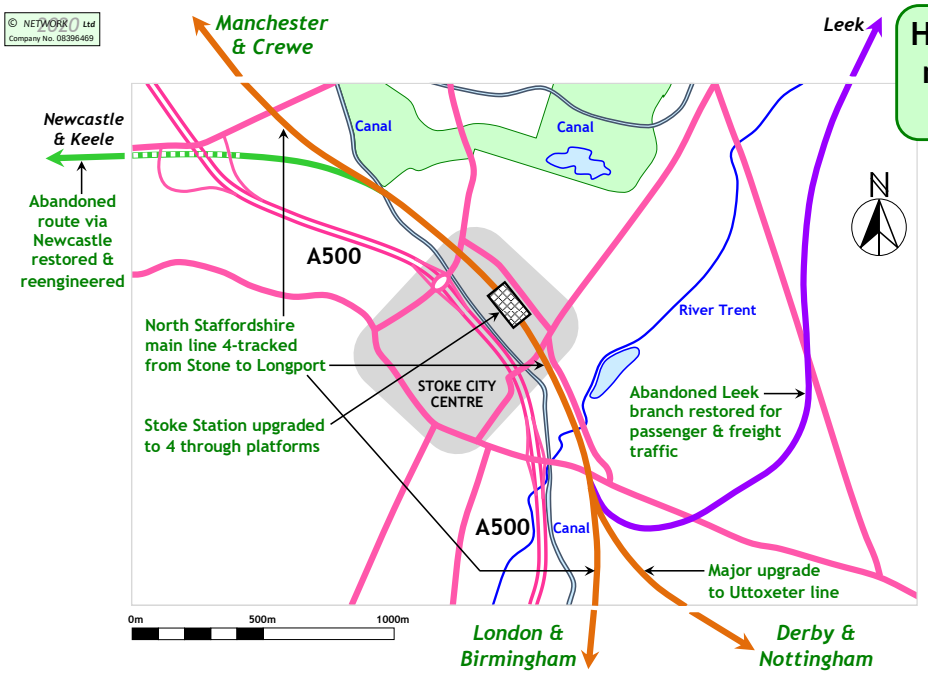
- HS2/HSUK in Stoke L.02
- HSUK station location L.03
- HSUK proposed works L.04
- HSUK local services L.05

L.01

Stoke/Potteries

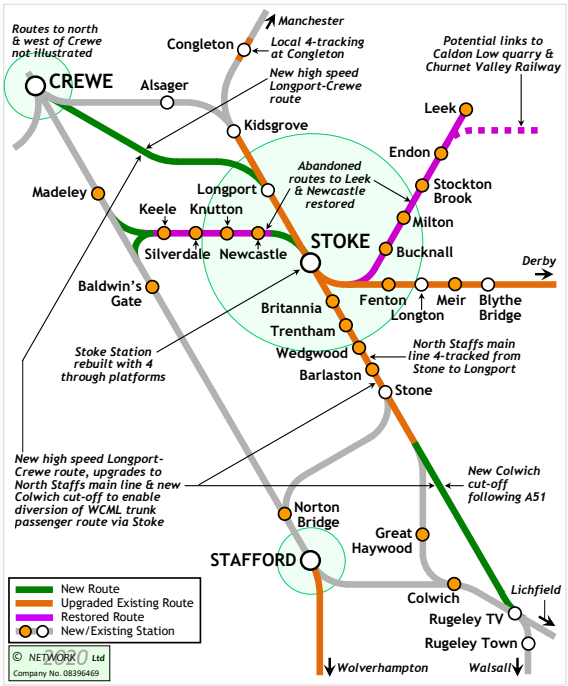
- HSUK/Midlands Ring will serve Stoke at its existing station, upgraded to 4 through platforms.
- This is part of wider strategy to divert WCML passenger route to serve Potteries conurbation and vastly improve Stoke's intercity links.
- North Staffs main line 4-tracked between Stone and Longport for enhanced capacity.
- No MRH services are proposed for Stoke.
- HS2 link only to London – none to Midlands.

L.02



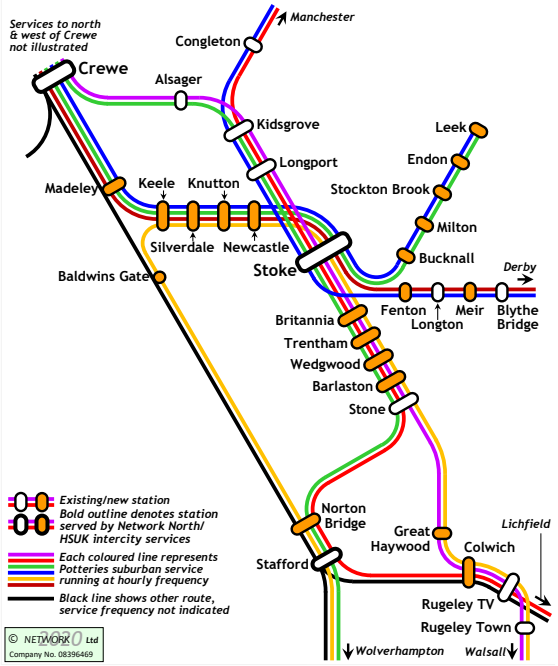
HSUK proposals for new local links at Stoke on Trent

L.03



HSUK Scheme for Improved Rail Infrastructure in Potteries

L.04



HSUK Scheme for Improved Local Services in Potteries

Illustrated services repeated every 60 minutes

L.05

East Midlands Cities

HSUK

- Derby M.02
- Nottingham M.03
- Leicester M.04

M.01

Derby

- HSUK/Midlands Ring will serve Derby at the existing 'Derby Midland' station.
- The need to reverse Birmingham-Nottingham services at Derby will be eliminated through restoration of the abandoned northern leg of the 'Derby Teardrop'.
- No HS2 services are proposed for Derby, only to remote Toton Parkway; MRH will only link Derby to Nottingham & Birmingham.

M.02

Nottingham

- HSUK/Midlands Ring will serve Nottingham at the existing 'Nottingham Midland' station.
- Routes east of Nottingham will be upgraded and restored (note Bottesford-Newark reopening) to promote operation of through intercity services without the need to reverse at Nottingham.
- No HS2 services are proposed for Nottingham, only to remote Toton Parkway; MRH will only link Nottingham to Leicester, Coventry, & B'ham.

M.03

Leicester

- HSUK/Midlands Ring will serve Leicester at the existing 'Leicester London Road' station.
- This station will be substantially redeveloped, and – due to its location on HSUK's north-south spine – will see vastly improved intercity links compared with Leicester's current poor connectivity.
- No HS2 services are proposed for Leicester; MRH will only link Leicester to Coventry, Birmingham & Nottingham.

M.04

Summary

Full integration		Midlands City/Airport	HS benefits	
HS2	HSUK		HS2	HSUK
✗	✓	Northampton	✗	✓
✗	✓	Coventry	✗	✓
✗	✓	B'ham Airport	✓	✓
✗	✓	Birmingham	✓	✓
✗	✓	Walsall	✗	✓
✗	✓	Wolverhampton	✗	✓
✗	✓	Stoke	✗	✓
✗	✓	Derby	✗	✓
✗	✓	Nottingham	✗	✓
✗	✓	Leicester	✗	✓

M.05

Network Aim 6

6. Achievement of radically enhanced capacity for railfreight

N.01

MC Freight Scheme??

- Under the MRH initiative, localised enhancements are proposed to increase capacity for freight.
- However, these interventions are limited, and there is no strategy to create dedicated railfreight routes.
- Without these routes, the improvements in freight capacity and connectivity necessary to deliver step-change road to rail modal shift and consequent major CO_2 emissions reductions cannot happen.

N.02

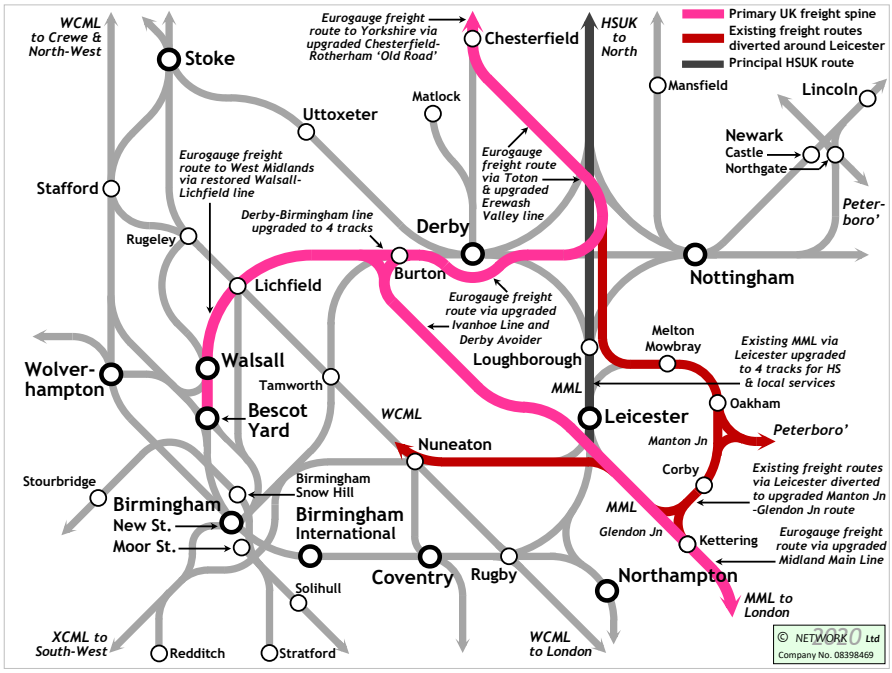
MC Scheme for Midlands Freight Upgrades

N.03

HSUK Freight Scheme

- HSUK's overall strategy includes the creation of a dedicated Eurogauge (UIC-C) national freight spine.
- This will be capable of carrying most standard articulated trailers and will enable major road-to-rail modal shift and hence major CO_2 reductions.
- The freight spine, following the M1/Midland Main Line corridor, is designed to avoid conflict with express passenger routes, in particular through Leicester.
- Likewise, new chords are proposed to enable existing Felixstowe-WCML flows to be diverted from Leicester.

N.04



HSUK Scheme for Midlands Railfreight

N.05

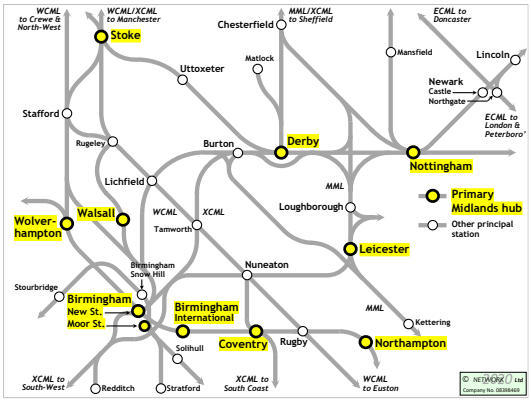
Network Aim 7

HSUK

7. Optimised direct links & journey time reductions to principal population centres in other UK regions.

P.01

National Links??



- 9 cities + 1 airport considered in connectivity analysis of rail network of the Midlands Engine
- Links to 41 cities + 4 airports considered in connectivity analysis of wider national rail network
- 45 possible links from 10 centres
- 450 links in total
- Timings for HSUK & HS2 set out on following slides calculated on similar basis to methodology set out in slide G.02

P.02

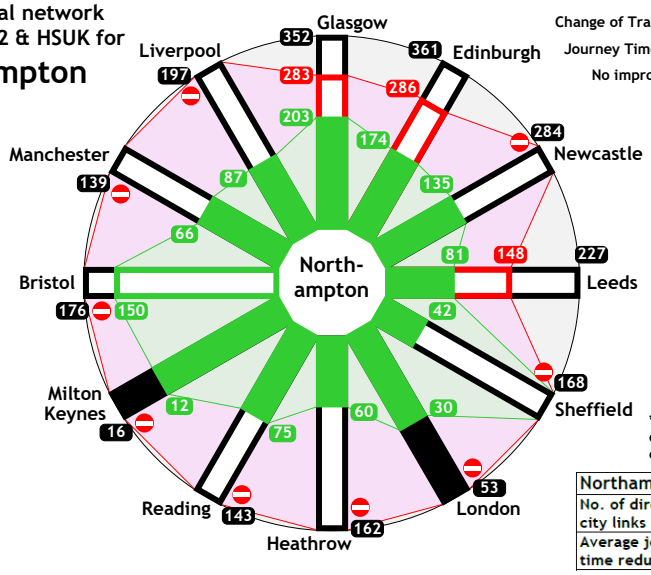
Journey Time Reductions Index to City Data

Northampton	P.04	Wolverhampton	P.09
Coventry	P.05	Stoke	P.10
B'ham Airport	P.06	Derby	P.11
Birmingham	P.07	Nottingham	P.12
Walsall	P.08	Leicester	P.13

Note: HSUK journey time data assumes HSUK north-south trunk route from Glasgow to London, with southern section following M1 corridor as per Slide F.10

P.03

Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for Northampton



Key

	Existing	HS2	HSUK
Direct Journey			
Change of Trains Req^{d}			
Journey Time (mins)	111	111	111
No improvement			

Notes:

All journey times to city centre stations

HS2 improvements all require change with shuttle transfer between B'ham International & B'ham Interchange

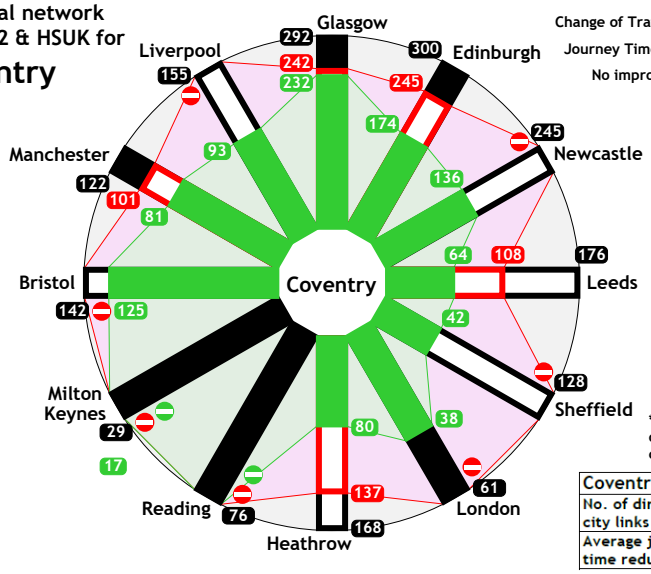
Journey times increased by 20 minutes for each change of trains

**45 hubs of UK rail network outside Midlands Engine area considered in figures below

Northampton	HS2	HSUK
No. of direct inter-city links (o/o 45**)	0	20
Average journey time reduction	5%	48%

P.04

Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for Coventry



Key

	Existing	HS2	HSUK
Direct Journey			
Change of Trains Req^{d}			
Journey Time (mins)	111	111	111
No improvement			

Notes:

All journey times to city centre stations

HS2 improvements all require change with shuttle transfer between B'ham International & B'ham Interchange

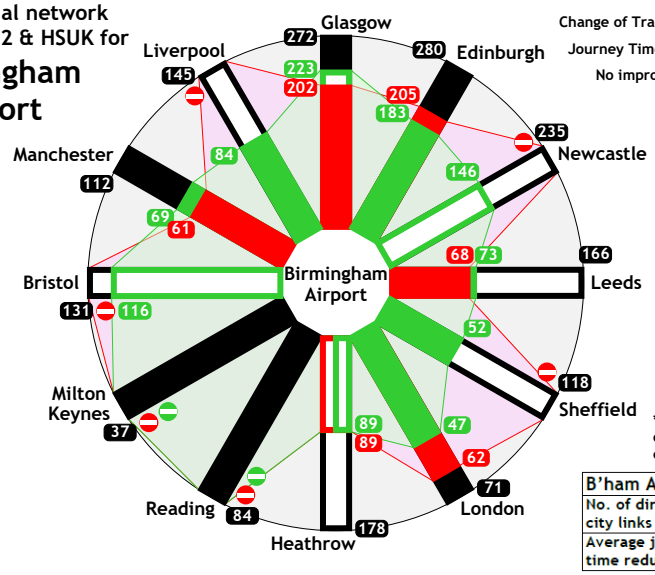
Journey times increased by 20 minutes for each change of trains

**45 hubs of UK rail network outside Midlands Engine area considered in figures below

Coventry	HS2	HSUK
No. of direct inter-city links (o/o 45**)	0	19
Average journey time reduction	6%	37%

P.05

Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for Birmingham Airport



Key

	Existing	HS2	HSUK
Direct Journey			
Change of Trains Req^{d}			
Journey Time (mins)	111	111	111
No improvement			

Notes:

All journey times to city centre stations

HS2 journey times include 5 minute shuttle transfer to Birmingham Inter-change

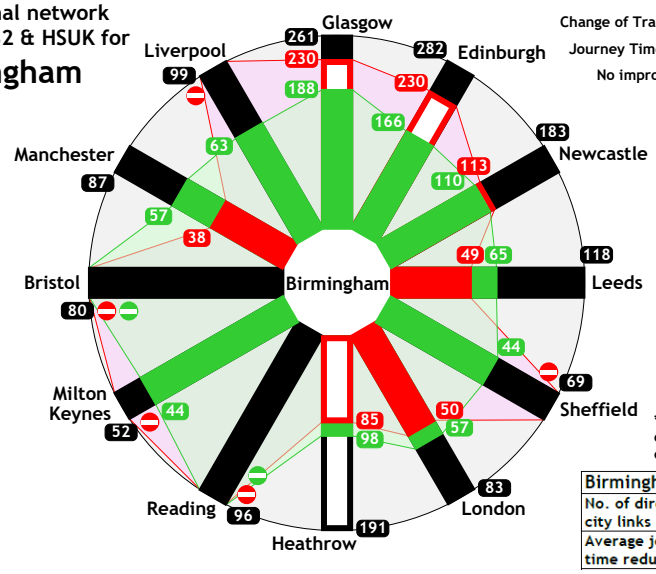
Journey times increased by 20 minutes for each change of trains

**45 hubs of UK rail network outside Midlands Engine area considered in figures below

B'ham Airport	HS2	HSUK
No. of direct inter-city links (o/o 45**)	8	19
Average journey time reduction	15%	34%

P.06

Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for Birmingham



Key

	Existing	HS2	HSUK
Direct Journey			
Change of Trains Req^{d}			
Journey Time (mins)	111	111	111
No improvement			

Notes:

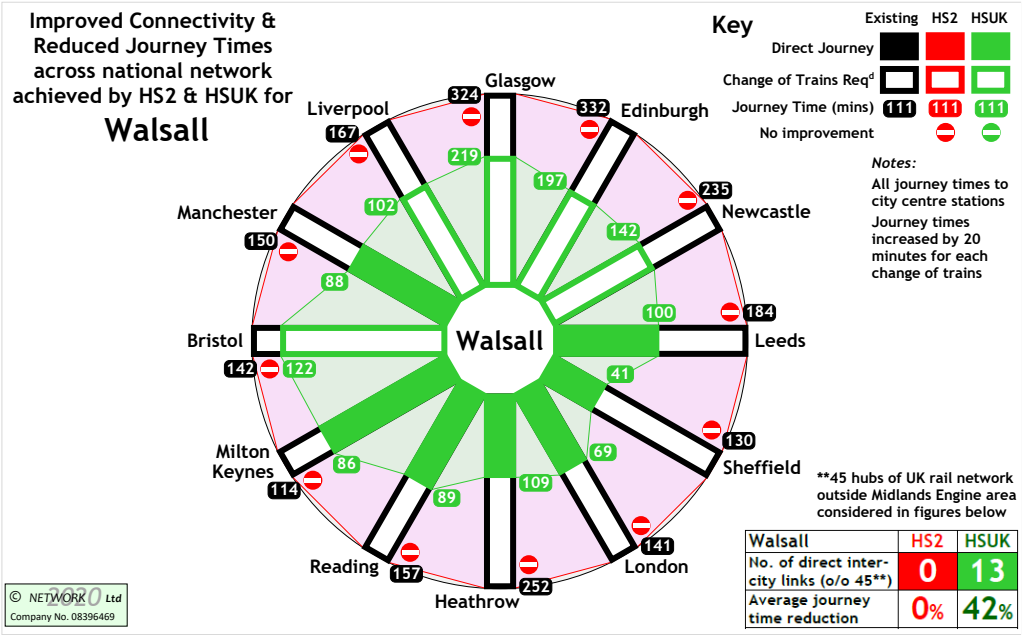
All journey times to city centre stations

Journey times increased by 20 minutes for each change of trains

**45 hubs of UK rail network outside Midlands Engine area considered in figures below

Birmingham	HS2	HSUK
No. of direct inter-city links (o/o 45**)	11	34
Average journey time reduction	21%	34%

P.07


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Walsall
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Glasgow
Edinburgh
Newcastle
Leeds
Sheffield
London
Heathrow
Reading
Milton Keynes
Bristol
Manchester
Liverpool
Walsall
324
332
235
184
130
141
252
157
114
142
150
167
219
197
142
100
41
69
109
89
86
122
88
102
**45 hubs of UK rail network outside Midlands Engine area considered in figures below
Walsall | HS2 | HSUK
No. of direct inter-city links (o/o 45**) | 0 | 13
Average journey time reduction | 0% | 42%
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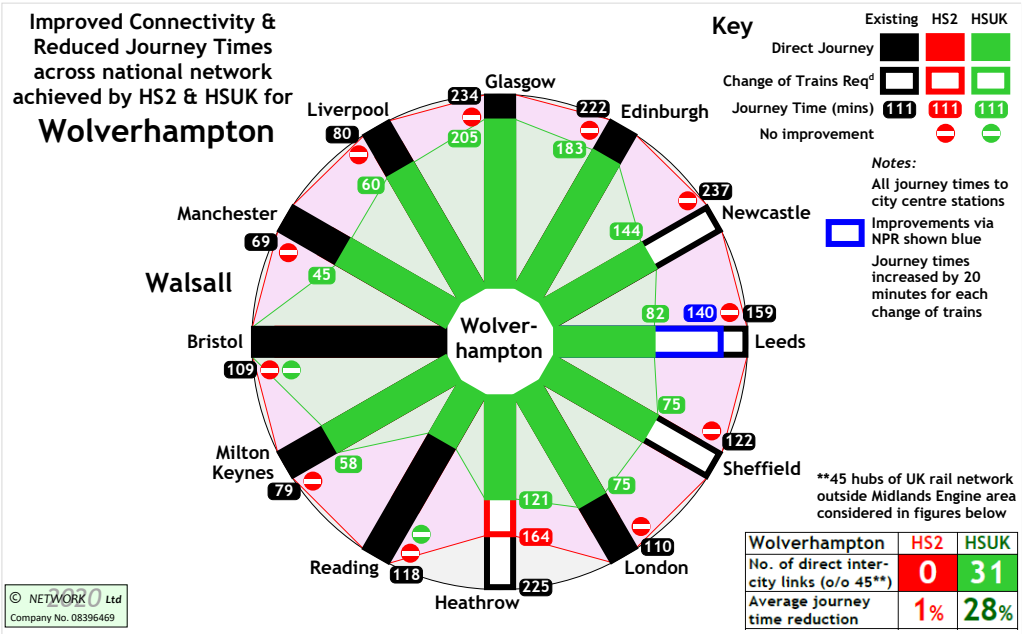
P.08


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Wolverhampton
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Improvements via NPR shown blue
Journey times increased by 20 minutes for each change of trains
Glasgow
Edinburgh
Newcastle
Leeds
Sheffield
London
Heathrow
Reading
Milton Keynes
Bristol
Manchester
Liverpool
Walsall
Wolver-hampton
234
222
237
159
122
110
225
118
79
109
69
80
205
183
144
82
140
75
75
121
164
58
45
60
**45 hubs of UK rail network outside Midlands Engine area considered in figures below
Wolverhampton | HS2 | HSUK
No. of direct inter-city links (o/o 45**) | 0 | 31
Average journey time reduction | 1% | 28%
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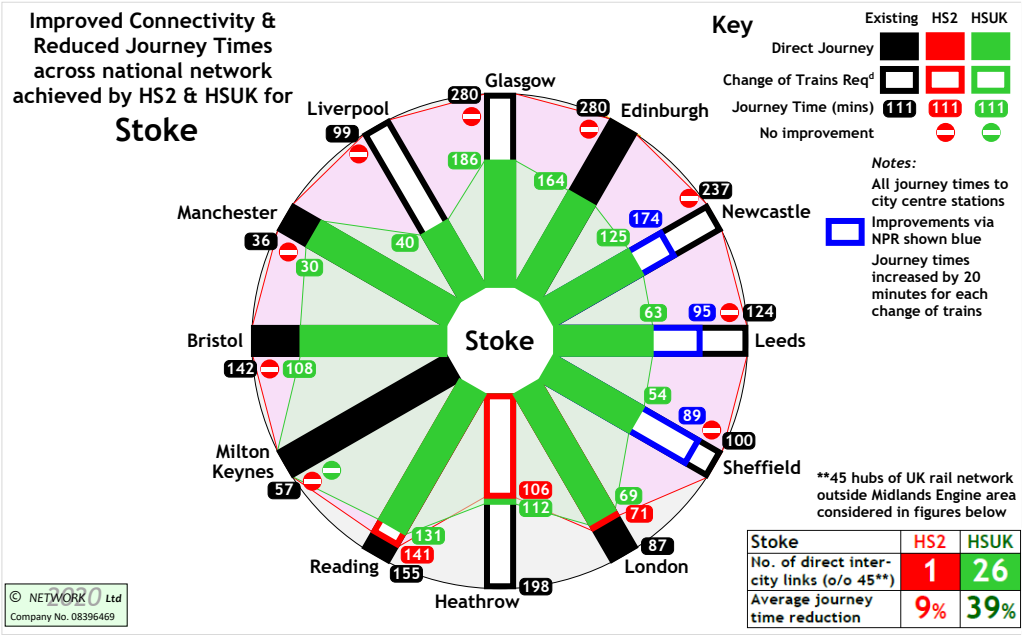
P.09


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Stoke
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Improvements via NPR shown blue
Journey times increased by 20 minutes for each change of trains
Glasgow
Edinburgh
Newcastle
Leeds
Sheffield
London
Heathrow
Reading
Milton Keynes
Bristol
Manchester
Liverpool
Stoke
280
280
237
174
125
124
95
63
100
89
54
87
71
69
106
112
198
155
141
131
57
142
108
36
30
40
99
186
164
**45 hubs of UK rail network outside Midlands Engine area considered in figures below
Stoke | HS2 | HSUK
No. of direct inter-city links (o/o 45**) | 1 | 26
Average journey time reduction | 9% | 39%
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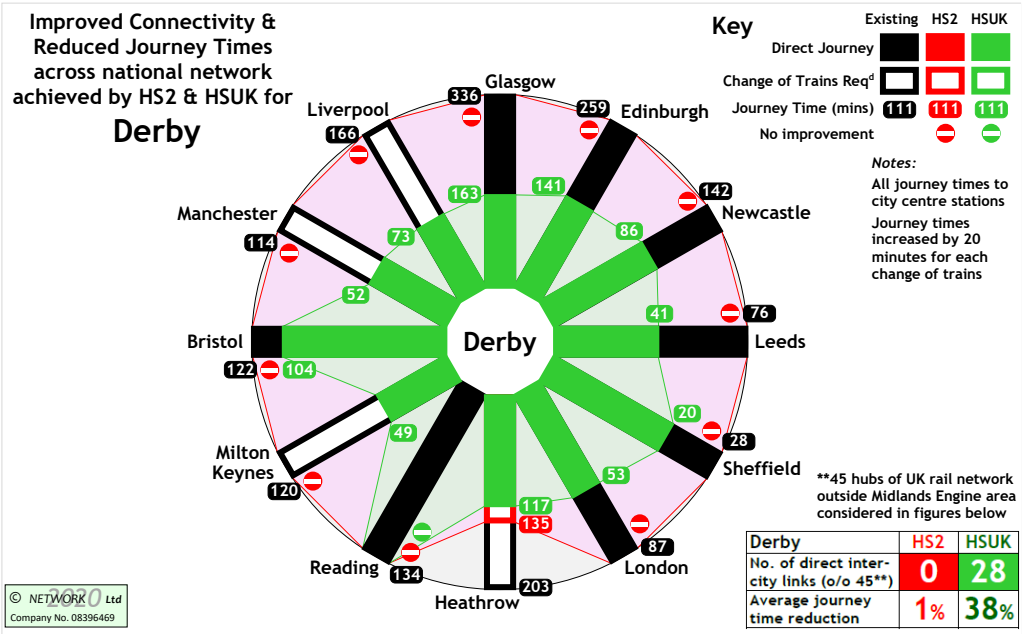
P.10


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Derby
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Glasgow
Edinburgh
Newcastle
Leeds
Sheffield
London
Heathrow
Reading
Milton Keynes
Bristol
Manchester
Liverpool
Derby
336
259
142
76
28
87
135
117
203
134
120
49
122
104
52
114
73
163
141
86
41
20
53
166
**45 hubs of UK rail network outside Midlands Engine area considered in figures below
Derby | HS2 | HSUK
No. of direct inter-city links (o/o 45**) | 0 | 28
Average journey time reduction | 1% | 38%
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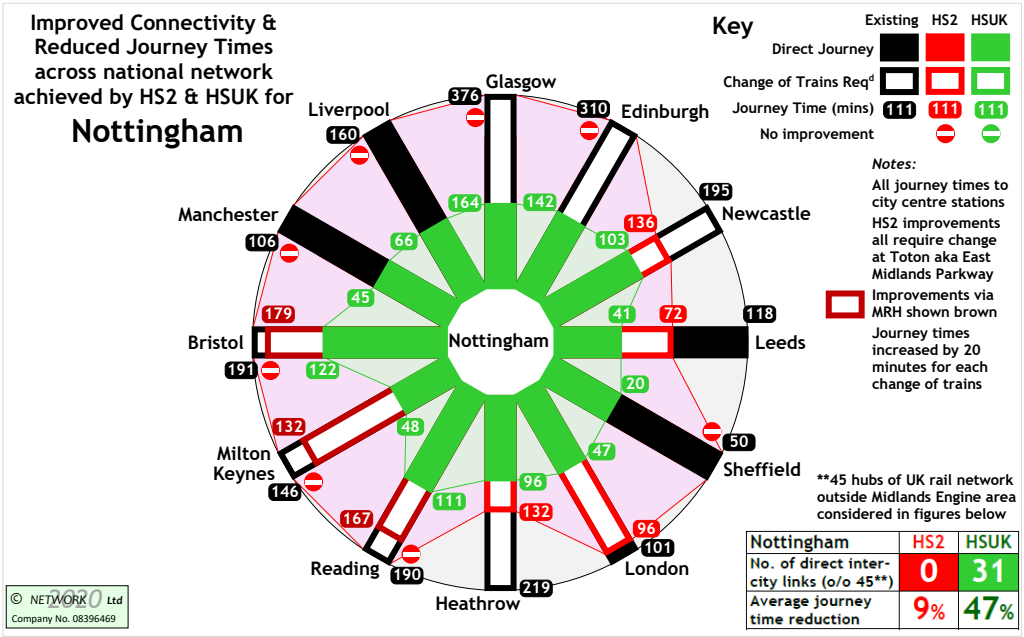
P.11


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Nottingham
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
HS2 improvements all require change at Toton aka East Midlands Parkway
Improvements via MRH shown brown
Journey times increased by 20 minutes for each change of trains
Glasgow
Edinburgh
Newcastle
Leeds
Sheffield
London
Heathrow
Reading
Milton Keynes
Bristol
Manchester
Liverpool
Nottingham
376
310
195
118
50
101
219
190
146
191
106
160
164
142
136
103
66
45
179
41
72
20
132
48
47
96
111
132
167
96
**45 hubs of UK rail network outside Midlands Engine area considered in figures below
Nottingham HS2 HSUK
No. of direct inter-city links (o/o 45**) 0 31
Average journey time reduction 9% 47%
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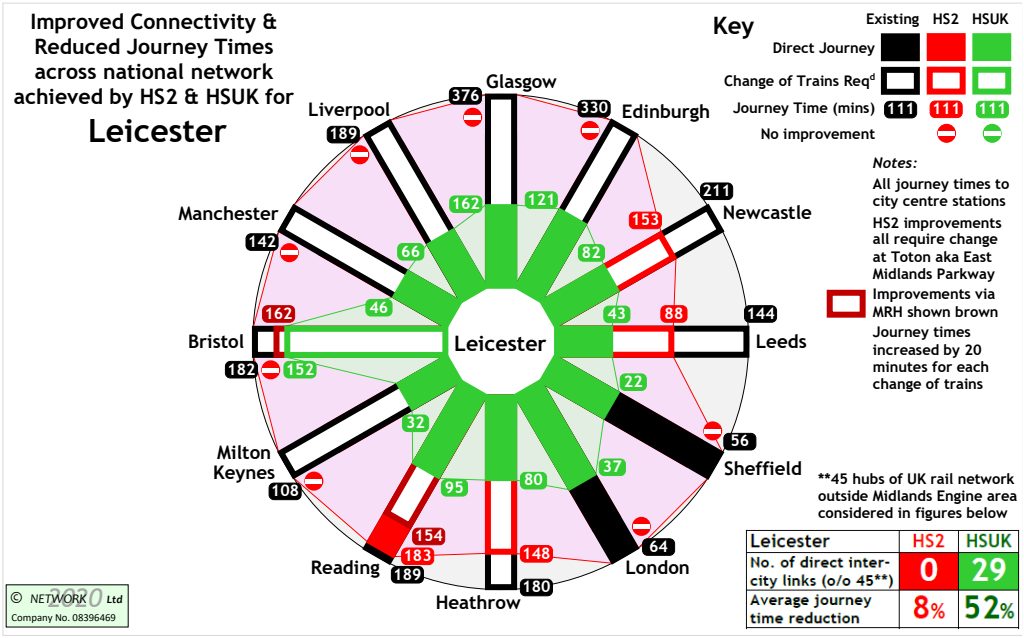
P.12


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Leicester
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
HS2 improvements all require change at Toton aka East Midlands Parkway
Improvements via MRH shown brown
Journey times increased by 20 minutes for each change of trains
Glasgow
Edinburgh
Newcastle
Leeds
Sheffield
London
Heathrow
Reading
Milton Keynes
Bristol
Manchester
Liverpool
Leicester
376
330
211
144
56
64
180
189
108
182
142
189
162
121
153
82
66
46
162
43
88
22
32
37
80
95
154
183
148
**45 hubs of UK rail network outside Midlands Engine area considered in figures below
Leicester HS2 HSUK
No. of direct inter-city links (o/o 45**) 0 29
Average journey time reduction 8% 52%
© NETWORK 2020 Ltd
Company No. 08396469
P.13

Direct Intercity Links without Change of Trains

HSUK

Considering 450 journeys linking 10 key Midlands Engine centres to 45 other centres of UK railway network:

- HS2 offers 20 direct links – 4% efficiency
- HSUK offers 250 direct links – 56% eff^{cy}

P.14

Overall Journey Time Reduction Performance

HSUK

Averaged across 450 journeys linking 10 key Midlands Engine centres to 45 other centres of UK railway network:

- HS2 achieves 8% average JT reduction
- HSUK achieves 41% average JT red^{n}

P.15

Final Scorecard

	Criterion	Metric	HSUK	MRH
1a	Compliance with MC specification?	**No specification**		
1b	Non-compliance with MC specification?	**No specification**		
2	Direct links between key centres?	out of 45	44	7
3	Step-change journey time reductions?	%	59%	8%
4	Full integration with local services?	Y/N	Y	N
5	Step-change local capacity increase?	Y/N	Y	N
6	Compatibility with freight vision?	Y/N	Y	N
7a	Direct links to other UK cities?	out of 450	250	20
7b	National journey time reductions?	%	41%	8%

HS2

HSUK wins on every criterion

Q.01

Simple Conclusion

- The HSUK Midlands Ring outperforms the official Midlands Rail Hub proposals by a factor of at least 5 on all criteria.
- This should not happen on a properly-remitted and well-regulated public infrastructure project.
- It is legitimate to inquire how this has happened.

Q.02

Rationale for MRH Fail

- The failure of Midlands Rail Hub in interconnecting the principal cities of the Midlands is directly attributable to HS2's almost complete lack of integration with the existing network, and its failure to provide any direct links between Midlands cities.
- This leaves the MRH programme of limited upgrades to key Midlands routes as the only intervention capable of enhancing connectivity between Midlands cities.
- By contrast HSUK's fully integrated approach, combining new, upgraded and restored routes, allows the creation of the Midlands Ring which vastly outperforms Midlands Rail Hub. Q.03

A Challenge to HS2 Ltd

- This study has demonstrated that on the available evidence, the failure of HS2 to integrate with the existing railway network renders the official Midlands Rail Hub scheme unable to meet the needs of the people of the Midlands for an efficient and optimised railway network.
- These assertions are justified by the vastly superior performance of Midlands Ring and the fully integrated High Speed UK Exemplar Alternative.
- HS2 Ltd must either:
  - refute these allegations; or…
  - provide further info to justify their own proposals; or…
  - abandon HS2 and support the HSUK alternative.

Q.04

Integrated Rail Plan - 1

- In February 2020 the Oakervee Review of the HS2 project recommended the development of an 'Integrated Rail Plan for the whole GB network'.
- This was intended to address HS2's self-evident lack of integration, and ensure that HS2, Northern Powerhouse Rail, Midlands Rail Hub and other major Network Rail upgrades would together deliver an efficient national rail network.
- The Government adopted Oakervee's recommendation, and is now developing the Integrated Rail Plan.

R.01

Integrated Rail Plan - 2

- So far, no criteria have been developed either to:
  - define the Integrated Rail Plan's technical objectives.
  - stipulate how the national railway system resulting from the 'Integrated Rail Plan for the whole GB network' should perform.
- Yet the Integrated Rail Plan can only have one basic aim – to develop for the people of the UK the best possible railway network, offering the greatest possible enhancement in connectivity and capacity, and thereby maximising both economic benefits and CO_2 reductions.

R.02

Integrated Rail Plan - 3

- It is vital for the interests, both of the UK regions and of the entire UK, that the Integrated Rail Plan delivers the best possible regional and national railway network.
- The 'Key Network Objectives' set out in Slide C.08 are precisely aligned with this fundamental aim, and effectively establish the requirements of the Integrated Rail Plan.
- HS2 & MRH comprehensively fail to meet these objectives.
- By contrast HSUK's success means that HSUK alone meets the fundamental aim of the Integrated Rail Plan.

R.03

Final thoughts…

HS2 and Midlands Rail Hub:

- Hardly a network; therefore…
- Barely any economic benefit;
- No regional rebalancing;
- Minimal CO_2 reductions;
- Little post-pandemic recovery;
- No justification whatsoever for HS2.

R.04

APPENDIX C

HSUK assessment of Integrated Rail Plan performance in Northern Powerhouse

With no definitive design criteria for the Integrated Rail Plan established by the Government, HSUK has set 7 criteria by which schemes should be assessed:

1. Full compliance with any core specification *(note the NPR specification for journey time and service frequency between primary Northern Powerhouse cities set out in The Northern Transport Strategy: Spring 2016 Report, published March 2016 by Transport for the North).*
2. Direct links between all principal (Northern) population centres.
3. Delivery of maximised journey time reductions.
4. Full integration with local networks at city centre stations.
5. Delivery of step-change capacity gains for local services.
6. Provision of radically enhanced capacity for railfreight *(note the TfN ambition for a 'freight superhighway connecting Liverpool and the Humber' set out in Draft Strategic Transport Plan, published January 2018 by Transport for the North).*
7. Optimisation of direct links & reductions in journey time to principal population centres across national network.

The following assessment shows HSUK's comprehensive superiority over any local network based upon the official HS2 and Northern Powerhouse Rail proposals. The assumption is made that the Integrated Rail Plan will stipulate that these proposals are implemented in full; any scope reductions in either scheme (for instance possible curtailment of the HS2 Phase 2b 'Eastern Arm') will further exacerbate the inadequate performance of the official proposals.

It should particularly be noted that predication upon the established HS2 proposals in both Greater Manchester and Yorkshire has prevented Northern Powerhouse Rail from meeting its own specification for journey time and service frequencies.

Further information on the performances of HS2 and HSUK as national propositions is given in Appendix D, see Figures 4.1, 4.2, 4.3, 7.1 and 7.2.

Northern Powerhouse Rail & HS2

Are they the network that the North needs?

Do they deliver the Integrated Rail Plan?

and… Can they meet the HSUK Challenge?

A study by **Colin Elliff BSc CEng MICE**

Hold this thought…

- The HS2 project can only be justified if it results in an improved national railway network, offering step-change enhancements in capacity and connectivity.
- This improved national network is vital to deliver the HS2 promises of economic benefit, regional rebalancing and reductions in CO_2 emissions, and to build back better after the COVID-19 pandemic.
- HS2 cannot be an end in itself.

A.01

Executive Summary - 1

1. The Northern Powerhouse Rail (NPR) initiative is vital to creating the enhanced transport network in the North that is necessary:
   - to spur the economic development of the Northern Powerhouse;
   - to meet the Government's 'levelling up' agenda;
   - to deliver step-change CO_2 reductions in line with 'net zero' commitments;
   - to 'build back better' after the COVID-19 pandemic.
2. This demands not any rail network, but the best possible railway network, delivering the greatest possible connectivity and capacity between the principal cities of the North.

A.02

Executive Summary - 2

3. This study defines 7 core performance requirements of an enhanced rail network for the Northern Powerhouse:
   - compliance with the TfN journey time specification;
   - direct intercity links between all principal population centres;
   - step-change journey time reductions across Northern network;
   - city centre stations for full local/intercity integration;
   - step-change capacity increase for local services;
   - harmonisation with a parallel strategy for regional railfreight;
   - optimised intercity links to other major UK population centres.
4. This study reveals for the first time how a future UK rail network including Northern Powerhouse Rail & HS2 would perform against the 7 performance requirements listed above.

A.03

Executive Summary - 3

5. This study then contrasts NPR's & HS2's combined performance against that of the High Speed UK (HSUK) Exemplar Alternative.
6. On all comparators, HSUK vastly outperforms NPR/HS2.
7. NPR's failure can be attributed to its dependency upon the established HS2 proposals. This false imperative has prevented NPR from meeting its own journey time/frequency specification.
8. By contrast HSUK's design as an integrated national intercity network, independent of HS2, gives far superior performance.
9. Northern Powerhouse Rail's & HS2's combined poor performance effectively sabotages the DfT's Integrated Rail Plan.
10. Only the fully integrated HSUK can deliver.

A.04

Contents

A.01 Exec Summary/Contents
B.01 Development of NPR
C.01 NPR – Does it Work?
D.01 HSUK Exemplar Alternative
E.01 Compliance with TfN Spec?
F.01 Comprehensive direct links?
G.01 Step-change journey time reductions?
H.01 NPR city proposals
I.01 HSUK proposals for…
J.01 Leeds & Bradford
K.01 Sheffield City Region
L.01 Manchester & MAN Airport
M.01 Liverpool/Merseyside
N.01 Stoke/Potteries
P.01 Transpennine Railfreight?
Q.01 Links to other UK regions?
R.01 Conclusions
S.01 Integrated Rail Plan

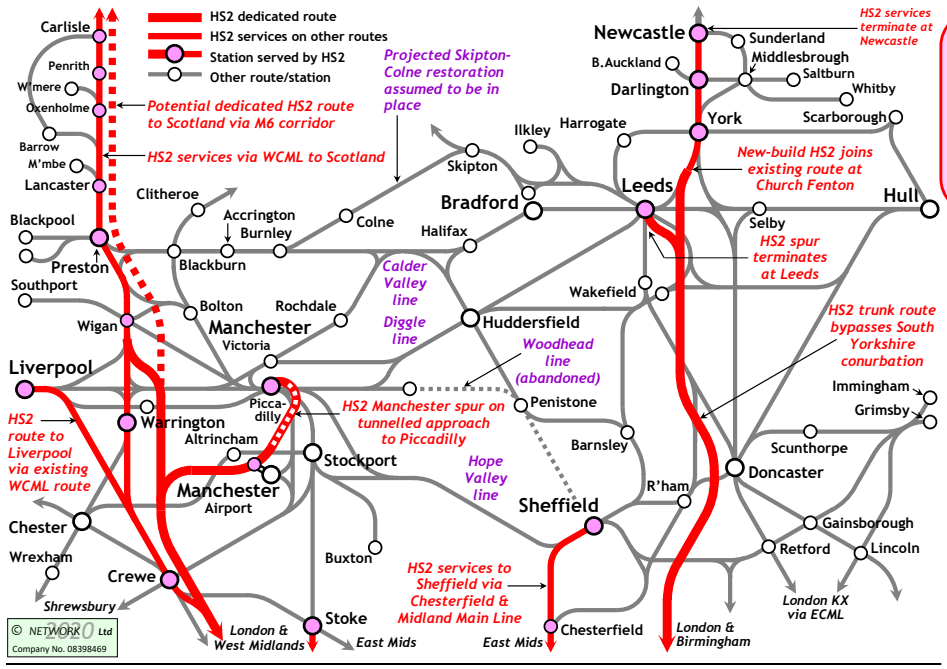
A.05

NPR Development

1. 2009 – HS2 project launched, with basic remit for new London – West Midlands high speed line.
2. 2010 – HS2 concept of national Y-network defined, with Ph1 London-West Mids stem splitting into Ph2a route to North-West and Ph2b route to Yorks.
3. 2012 - Ph2a and Ph2b routes confirmed. *Note no links created by HS2 between Northern cities.*

See Slide B.02

B.01



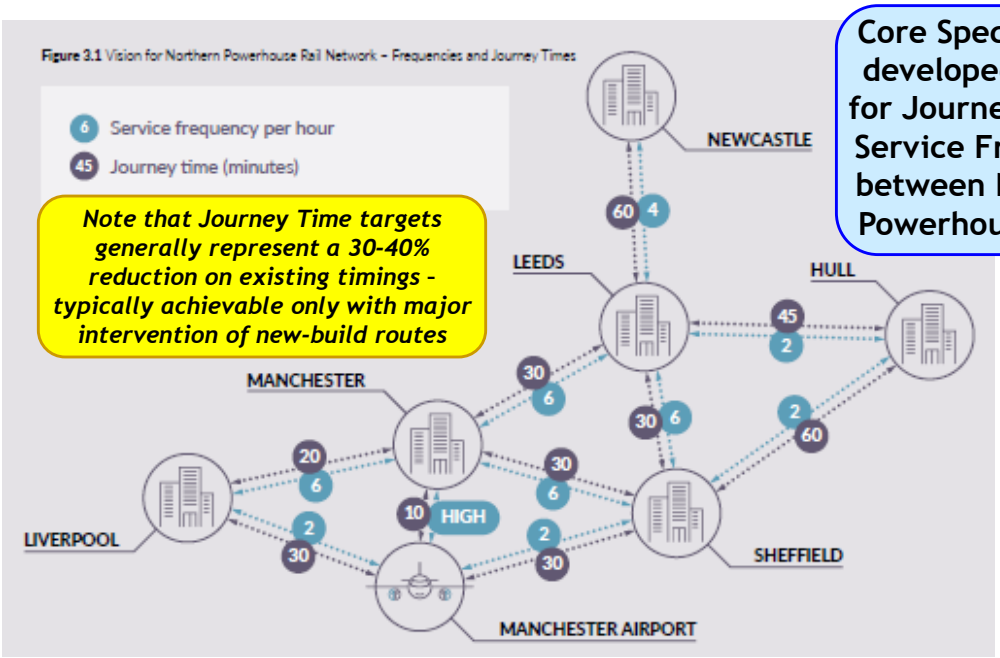
HS2 Phase 2b developed with no thought for transpennine links

B.02

NPR Development

4. 2014 – Chancellor George Osborne launches Northern Powerhouse initiative. Improved transpennine rail links key to economic development of Northern Powerhouse.
5. 2015 – Transport for the North (TfN) established to develop Northern Powerhouse Rail.
6. 2016 – TfN publishes core specification for journey time & service frequency on primary routes.

B.03



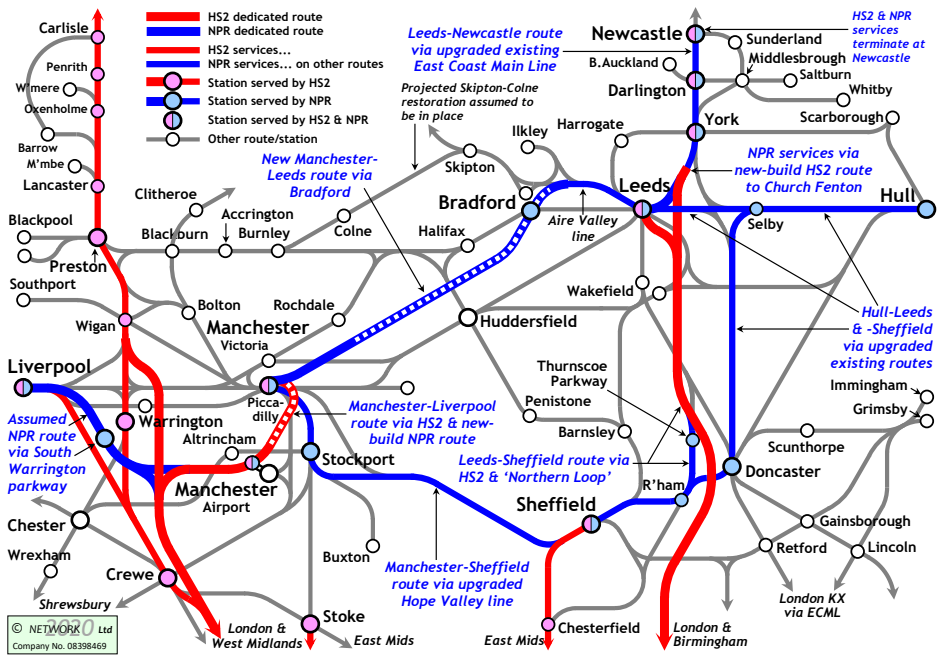
Core Specification developed by TfN for Journey Time & Service Frequency between Northern Powerhouse cities

B.04

NPR Development

7. 2016/20 – TfN develops Northern Powerhouse Rail scheme in conformance with established HS2 Ph2b proposals in Yorkshire and Greater Manchester.
8. 2018/19 – TfN's Strategic Transport Plan published, proposing new-build Manchester-Bradford-Leeds route, but no new Manchester-Sheffield route. Also Manchester-Liverpool & Sheffield-Leeds routes proposed, both dependent on sections of HS2.
   See Slide B.06

B.05



NPR Scheme based upon established HS2 Phase 2b

B.06

NPR – Further Steps

9. Nov 2020 – TfN issues 'Initial Preferred Way Forward' to Government – but no details of proposed routes or stations published.
10. End of 2020 – Government due to publish 'Integrated Rail Plan for whole GB network' – *a key recommendation of Oakervee Review of HS2 project*. NPR & HS2 key elements of Integrated Rail Plan.
11. August 2021 - So far, no Integrated Rail Plan.

B.07

NPR: Does it Work?

Comprehensive review of TfN outputs indicates:

- No evidence of definitive technical proposals for NPR routes or stations *(compare with HS2 progress!)*
- No evidence that TfN has adopted any structured approach to developing NPR as an optimised railway network.
- Plentiful evidence that NPR will fail to meet many aspects of TfN's core specification.

C.01

Nevertheless…

Despite lack of detailed proposals, sufficient information exists in TfN's technical outputs to:

- Assess NPR's likely improvements in intercity journey times & direct intercity links;
- Determine NPR's overall performance as a railway network interlinking the principal cities of the Northern Powerhouse.

C.02

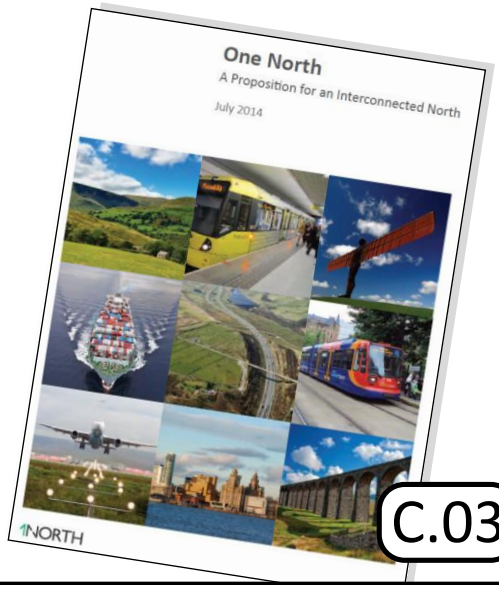
Primary Info Source 1

One North: A Proposition for an Interconnected North

'One North' group of Northern city councils (July 2014)

➔ This document established the core specification of intercity journey times. *See Slide B.04.*

Note that journey times to Hull were not included in 'One North'.



C.03

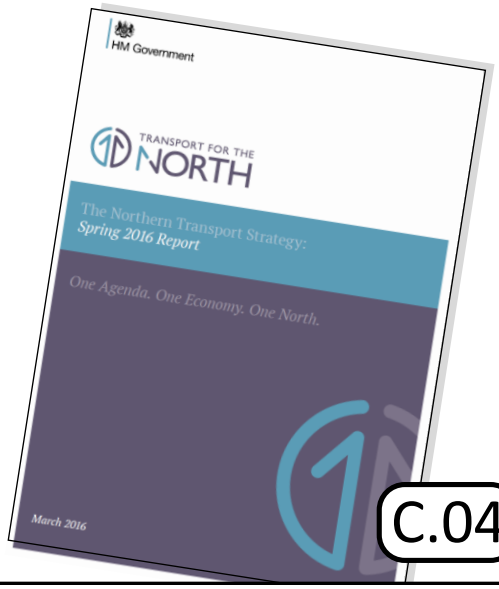
Primary Info Source 2

The Northern Transport Strategy: Spring 2016 Report

Transport for the North (March 2016)

- This document confirmed the core specification of intercity journey times (including Hull), and also set out required service frequencies.

See Slides B.04 & E.02



C.04

Primary Info Source 3a

Strategic Transport Plan: Final Draft

Transport for the North (January 2019)

- This document indicated proposed routes and set out journey times and service frequencies – *many in breach of core specification.*

See Slide E.03.

C.05

Primary Info Source 3b

Strategic Transport Plan: Final Draft

Transport for the North (Jan 2019)

- Proposed routes shown on Page 113 →
- Journey times and service frequencies shown on Page 112 →

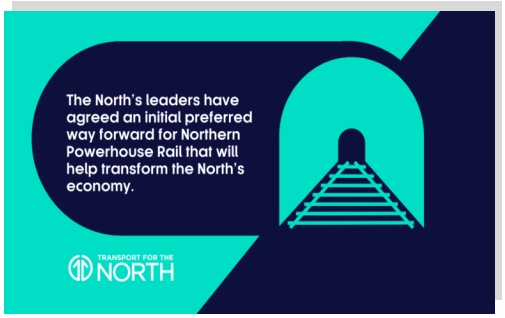
Corridor concepts under consideration		Best current		Best potential with Northern Powerhouse Rail	
		frequency	minutes	frequency	minutes
Newcastle - Leeds	Infrastructure upgrades	3	88-95'	4	58
Leeds - Hull	Infrastructure upgrades	1	57	2	38
Sheffield - Leeds	Infrastructure upgrades and use of HS2	1	39-42	4	28
Sheffield - Hull	Infrastructure upgrades	1	80-86	2	50
Manchester - Sheffield	Infrastructure upgrades	2	49-57	4	40
Leeds - Manchester	A new line serving Bradford via Parkway or Centrally Diggle Upgrades Akin to New Line	4	46-58	6	25
Liverpool - Manchester**	A new line via Warrington Southern Parkway or Centrally A Fiddlers Ferry upgrade	4	37-57	6	26'

C.06

Primary Info Source 4a

TfN press release: 19 Nov 2020

- It was announced that TfN had issued their 'Initial Preferred Way Forward' to Government.
- Whilst further indicative info was provided re proposed stations, no detailed information of proposed routes was given.



https://transportforthenorth.com/press-release/gov-recommendations-northenpowerhouserail/

- The sketch shown on Slide C.06 remains the best indicator of TfN's 'Initial Preferred Way Forward'.

C.07

Primary Info Source 4b

TfN press release: 19 Nov 2020

The TfN press release confirmed:

- No proposal for a new NPR high speed line in County Durham – *hence NPR cannot achieve the 60 minute target for the Leeds-Newcastle journey time.*
- An intention for a central station in Warrington - *but no technical detail of the 8km long tunnel necessary to incorporate this station into a time-critical new route linking Manchester and Liverpool. Hence not accepted and southern parkway assumed instead.*

C.08

Remember…

It cannot be disputed that…

➔ To deliver the greatest possible economic and environmental benefits, the Northern Powerhouse needs the best possible railway network, providing the greatest possible enhancements in connectivity and capacity.

C.09

Remember…

It also cannot be disputed that…

- Any proposed 'NPR network' must be designed to deliver optimum performance as a network.
- This cannot be left to chance – it is no good simply designing new high speed lines in isolation from the existing railway system, and hoping for the best.

C.10

Key Network Objectives

An ideal Northern Powerhouse rail network should…

1. Comply fully with TfN core specification.
2. Directly interlink all principal Northern population centres.
3. Deliver maximised journey time reductions.
4. Integrate fully with local networks at city centre stations.
5. Deliver step-change capacity gains for local services.
6. Be compatible with TfN ambition for 'freight superhighway'.
7. Optimise direct links & reductions in journey time to principal population centres across national network.

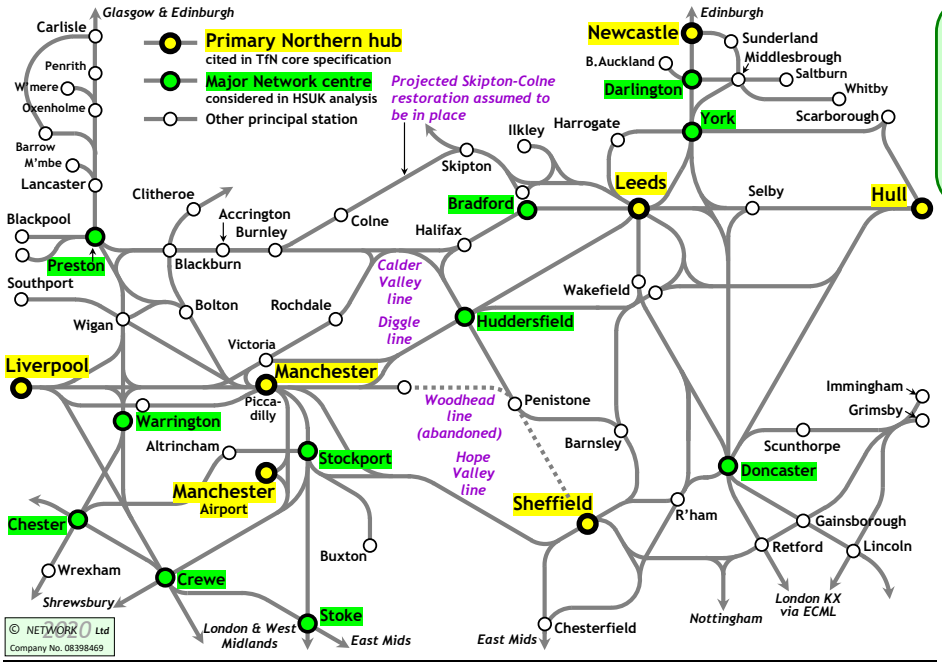
C.11

18 Hubs Considered in HSUK Network Analysis

Doncaster		Stoke	
Sheffield		Crewe	
Huddersfield		Chester	
Bradford		Stockport	
Leeds		Manchester Airport	
Hull		Manchester	
York		Warrington	
Darlington		Preston	
Newcastle		Liverpool	

- 7 Primary Network Hubs
- 11 additional Major Network Centres

C.12



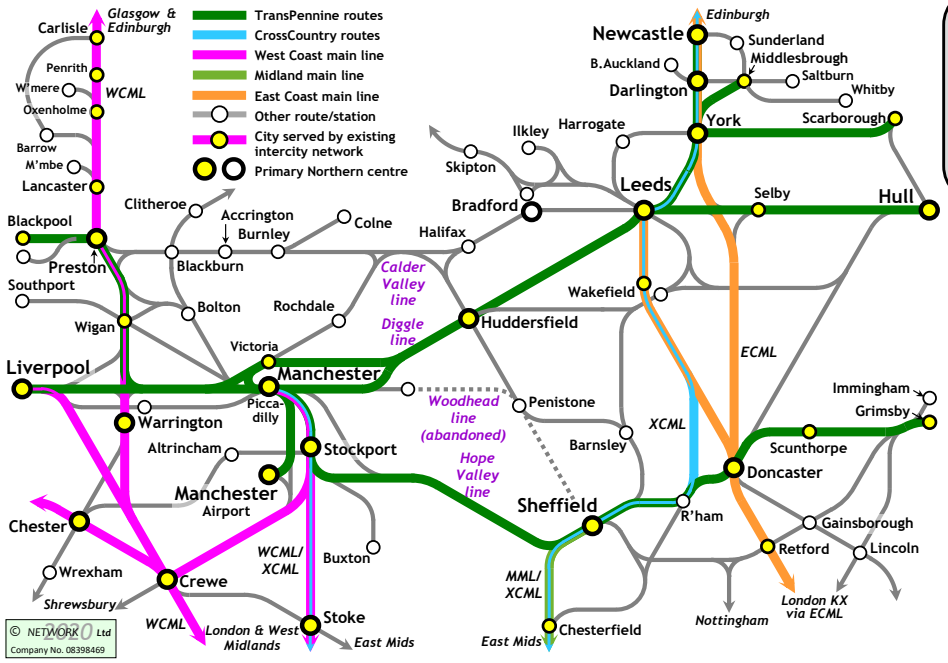
17 Cities & 1 Airport considered in HSUK network analysis

C.13

Basis of Analysis

- Any judgment on network performance can only be made in the context of the performance of the existing network.
- Primary problem:
  - High quality links to London (WCML to Liverpool & Manchester, MML to Sheffield, ECML to Leeds)
  - Much poorer quality transpennine links between Liverpool, Manchester, Sheffield, Leeds

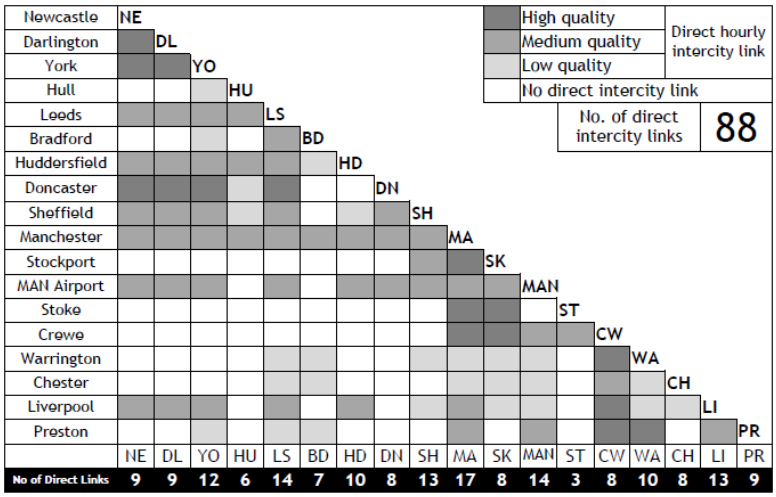
C.14



Existing intercity network in Northern Powerhouse

C.15

Existing Network Links



Existing network offers **88** direct intercity links out of **153** possible.

58% Network efficiency

C.16

The High Speed UK Exemplar Alternative

- A properly informed judgement on NPR's performance as an intercity network, and on its worth as a public infrastructure project, can only be made through rigorous comparison with an 'Exemplar Alternative'.
- High Speed UK provides this Exemplar Alternative.

D.01

The HSUK Alternative

- Unlike NPR or HS2, HSUK has been designed from the outset as a national intercity network, with the basic aim of establishing frequent and direct intercity links between all major UK regional cities.
- The HSUK design is supported by detailed design (at 1:25,000 scale) of over 1,000km of new, upgraded and restored railway. This has in turn allowed detailed estimation of construction cost, and calculation of journey times on all intercity routes.

D.02

Network North & HSUK

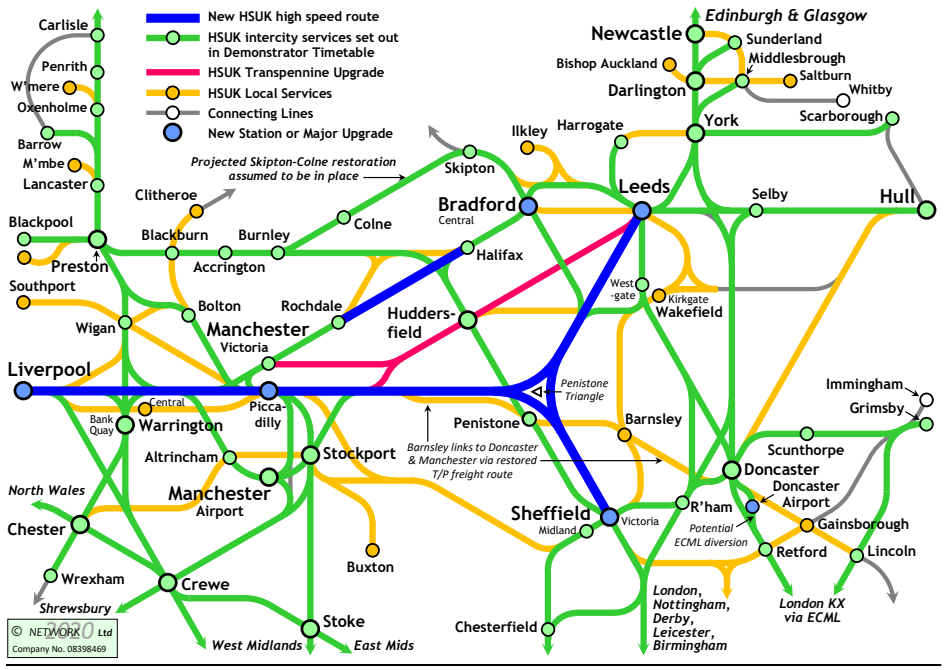
- The elements of High Speed UK in the Northern Powerhouse region are presented as 'Network North'.
- Network North has the same fundamental aim as Northern Powerhouse Rail (NPR) – to interconnect the major cities of the North, and hence promote economic growth.
- The detailed design supporting Network North allows rigorous comparisons to be made with NPR on a wide range of technical criteria.

D.03

Network North Services

- High Speed UK/Network North intercity services will extend to all major population centres in the Northern Powerhouse.
- These services will be fully integrated with a wider network of local services accessing most communities.

D.04



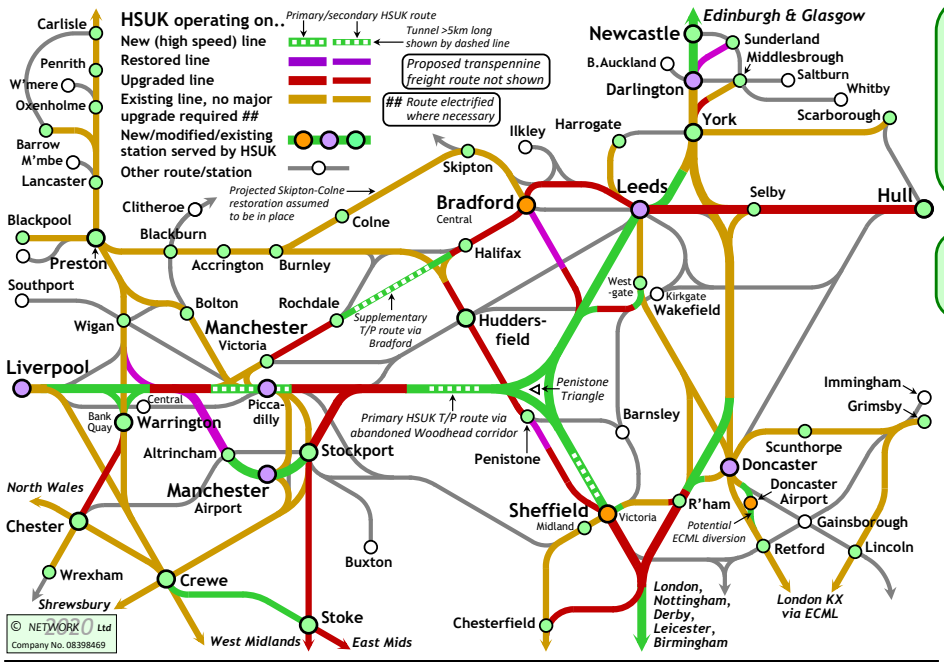
HSUK Intercity Network in Northern Powerhouse

D.05

Network North Routes

- High Speed UK/Network North services will operate on a blend of:
  - New-build routes;
  - Upgraded existing routes;
  - Restored abandoned routes.
- This is harmonious with wider initiatives to:
  - Create a dedicated transpennine freight route; and
  - Electrify most Northern rail routes.

D.06



HSUK Proposed Infrastructure in Northern Powerhouse

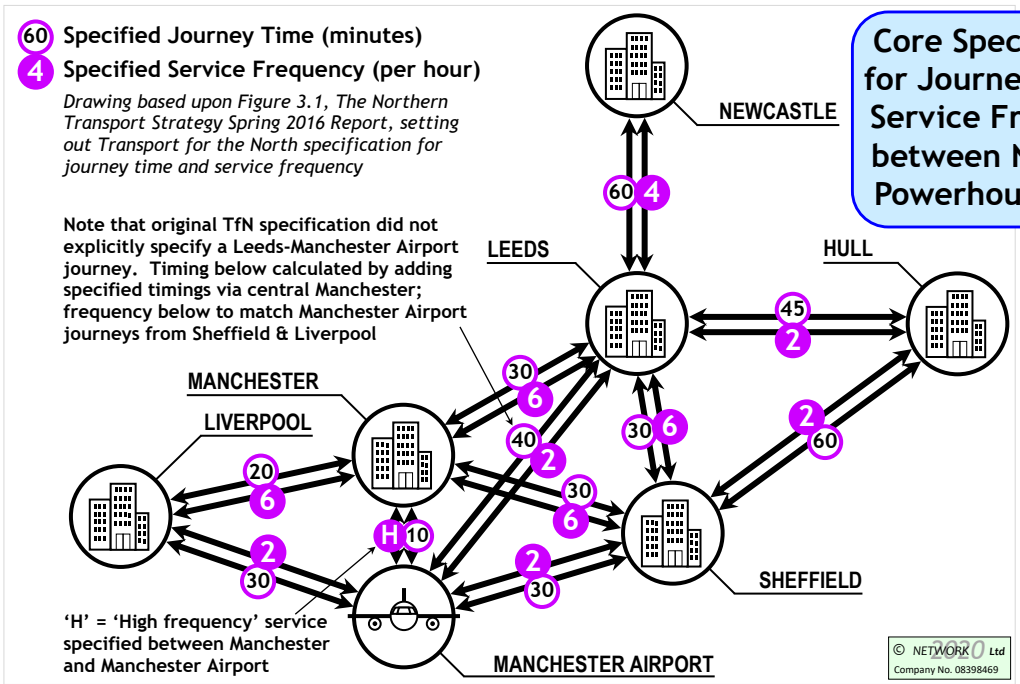
Proposed transpennine freight route not shown

D.07

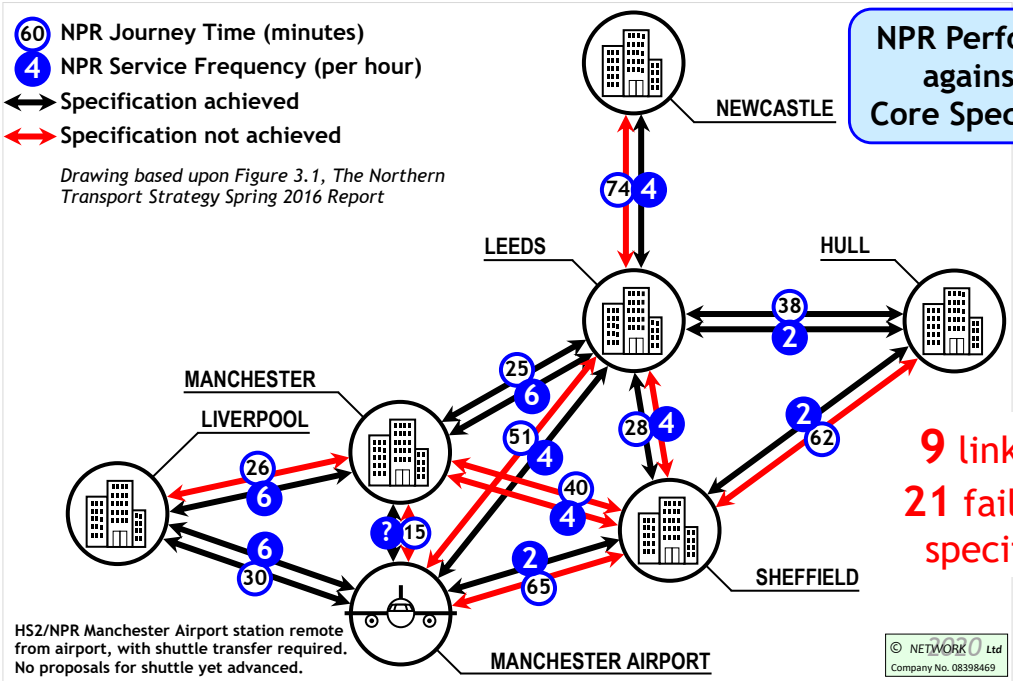
Network Aim 1

1. Full compliance with TfN core specification for journey time & service frequency

E.01



E.02


60 NPR Journey Time (minutes)
4 NPR Service Frequency (per hour)
Specification achieved
Specification not achieved
Drawing based upon Figure 3.1, The Northern Transport Strategy Spring 2016 Report
NPR Performance against TfN Core Specification
NEWCASTLE
LEEDS
HULL
MANCHESTER
LIVERPOOL
SHEFFIELD
MANCHESTER AIRPORT
74 4
38 2
25 6
51 4
28 4
2 62
26 6
40 4
? 15
6 30
2 65
9 links out of 21 fail to meet specification
HS2/NPR Manchester Airport station remote from airport, with shuttle transfer required. No proposals for shuttle yet advanced.
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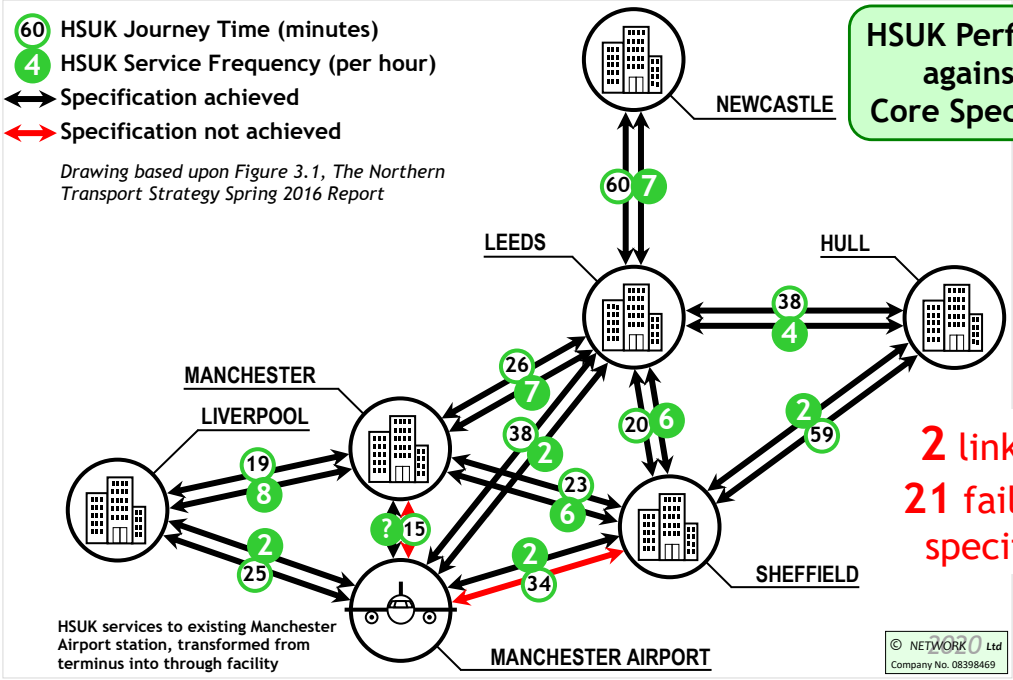
E.03


60 HSUK Journey Time (minutes)
4 HSUK Service Frequency (per hour)
Specification achieved
Specification not achieved
Drawing based upon Figure 3.1, The Northern Transport Strategy Spring 2016 Report
HSUK Performance against TfN Core Specification
NEWCASTLE
LEEDS
HULL
MANCHESTER
LIVERPOOL
SHEFFIELD
MANCHESTER AIRPORT
60 7
38 4
26 7
38 2
20 6
2 59
19 8
23 6
? 15
2 25
2 34
2 links out of 21 fail to meet specification
HSUK services to existing Manchester Airport station, transformed from terminus into through facility
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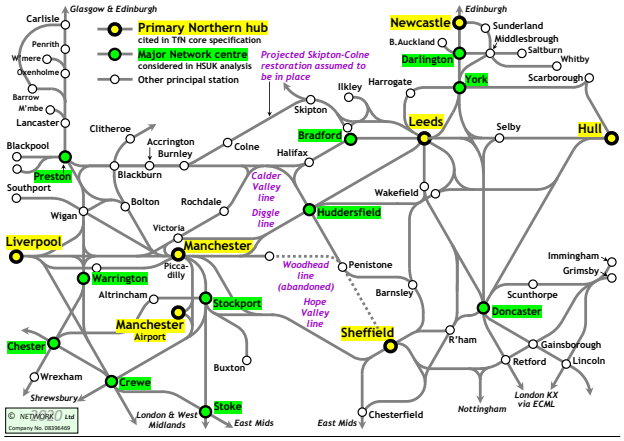
E.04

Network Aim 2

2. Comprehensive direct links between principal centres of Northern Powerhouse

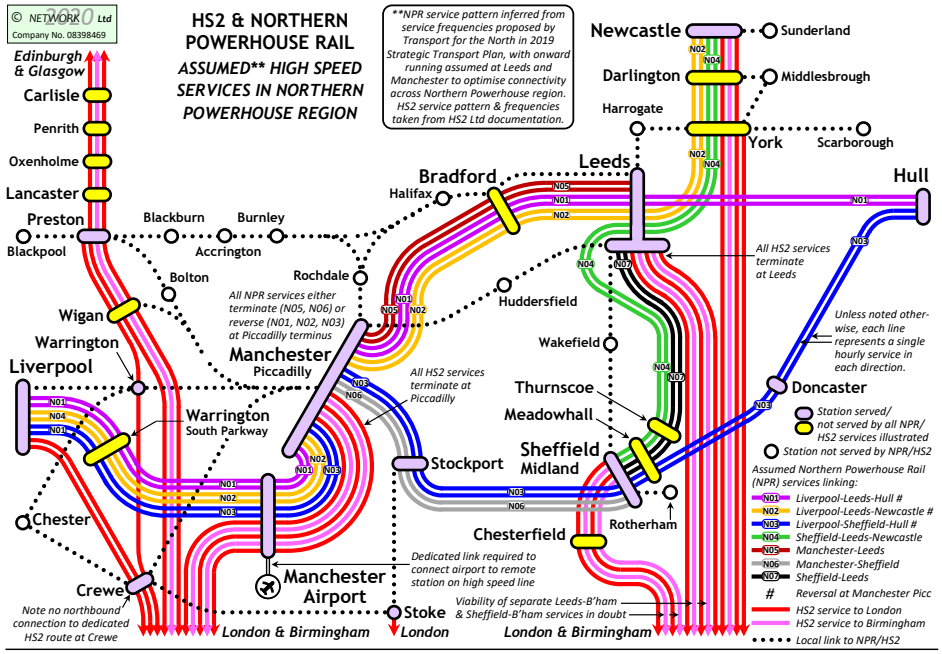
F.01

Direct Links??



- 17 cities + 1 airport considered in connectivity analysis of rail network of the Northern Powerhouse
- 17 possible links from 18 centres
- 153 links in total

F.02



NPR/HS2 Assumed Service Pattern

F.03

Direct Links via NPR

HSUK

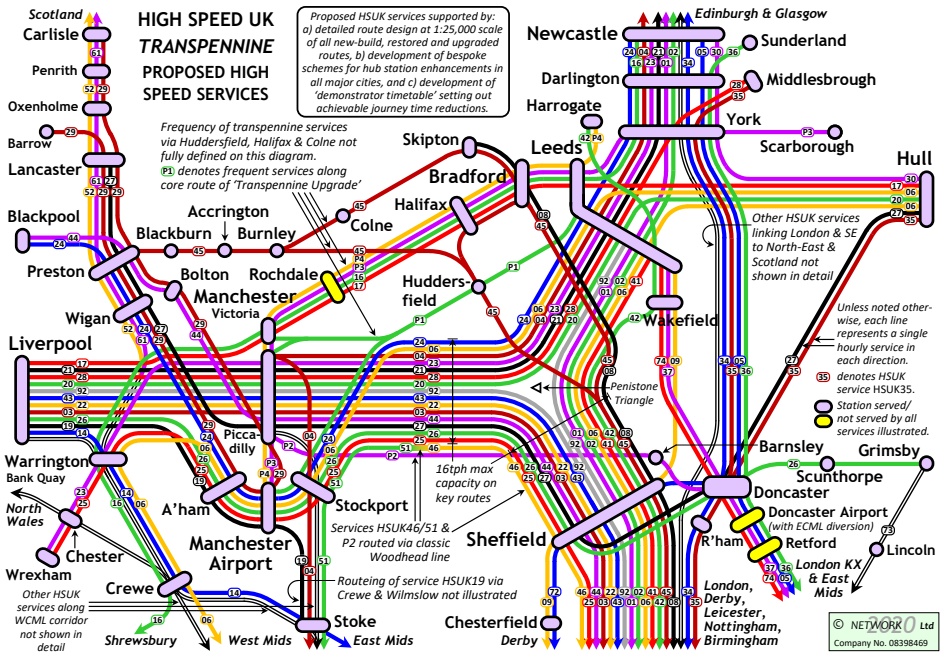
	NE	DL	YO	HU	LS	BD	HD	DN	SH	MA	SK	MAN	ST	CW	WA	CH	LI	PR
Newcastle																		
Darlington																		
York																		
Hull																		
Leeds																		
Bradford																		
Huddersfield																		
Doncaster																		
Sheffield																		
Manchester																		
Stockport																		
MAN Airport	#	#	#	#	#	#		#	#		#							
Stoke																		
Crewe																		
Warrington																		
Chester																		
Liverpool	#	#	#	#	#	#		#	#		#							
Preston																		
No of Direct Links	9	9	9	9	10	8	9	6	10	12	6	12	0	3	3	0	13	2

4	HS2 direct intercity link
52	NPR direct intercity link
8	TPUG direct intercity link
#	Manchester Picc. reversal
89	Existing intercity link
	No direct intercity link
No. of direct intercity links	64

Including TP Upgrade links to Huddersfield, NPR/HS2 offers **64** direct intercity links out of **153** possible.

42% Network efficiency

F.04



HSUK Designed Service Pattern

F.05

Direct Links via HSUK

	NE	DL	YO	HU	LS	BD	HD	DN	SH	MA	SK	MAN	ST	CW	WA	CH	LI	PR
Newcastle																		
Darlington																		
York																		
Hull																		
Leeds																		
Bradford																		
Huddersfield																		
Doncaster																		
Sheffield																		
Manchester																		
Stockport																		
MAN Airport																		
Stoke																		
Crewe																		
Warrington																		
Chester																		
Liverpool																		
Preston																		
No of Direct Links	17	17	17	15	17	13	12	12	16	17	17	17	13	14	17	11	15	15

128	HSUK direct intercity link
8	TPUG direct intercity link
17	Existing intercity link
	No direct intercity link
No. of direct intercity links	136

Including TP Upgrade links to Huddersfield, HSUK offers **136** direct intercity links out of **153** possible.

89% Network efficiency

F.06

Network Aim 3

3. Step-change journey time reductions on intercity routes within Northern Powerhouse

G.01

Journey Time Calcs

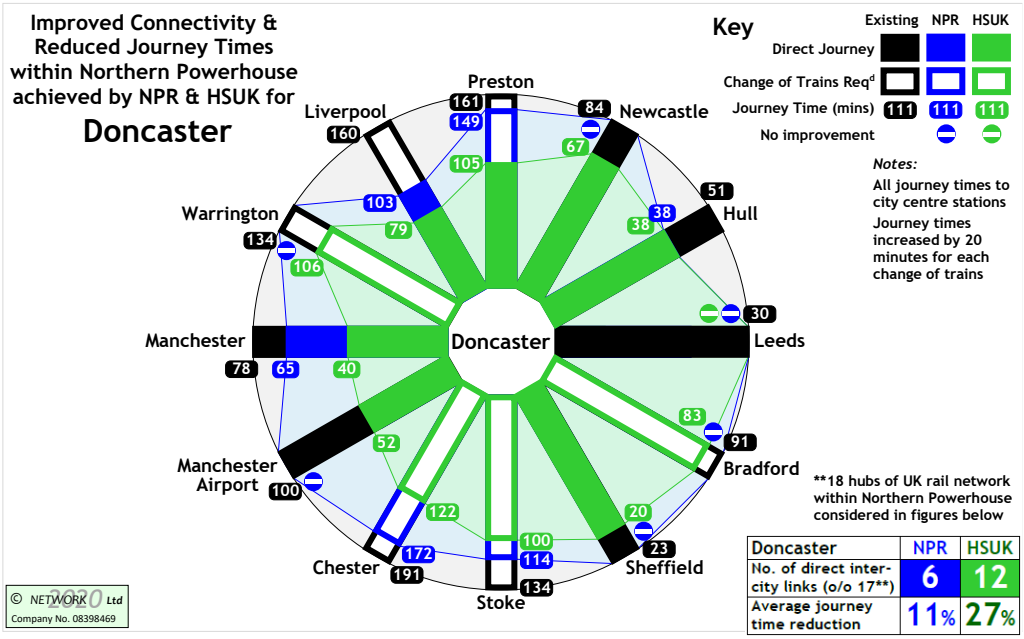
- Comprehensive route design of HSUK's new-build, upgraded and restored lines allows direct journey times to be calculated for all the proposed services illustrated in Slide F.05.
- NPR direct journey times are based on the services illustrated in Slide F.03 and journey times published by TfN.
- Times for journeys requiring a change of trains include an allowance of 20 minutes to reflect the 'deterrent effect' of changing trains.
- HSUK, NPR and existing journey times to 12 principal Northern Powerhouse centres are presented on the following slides.

G.02

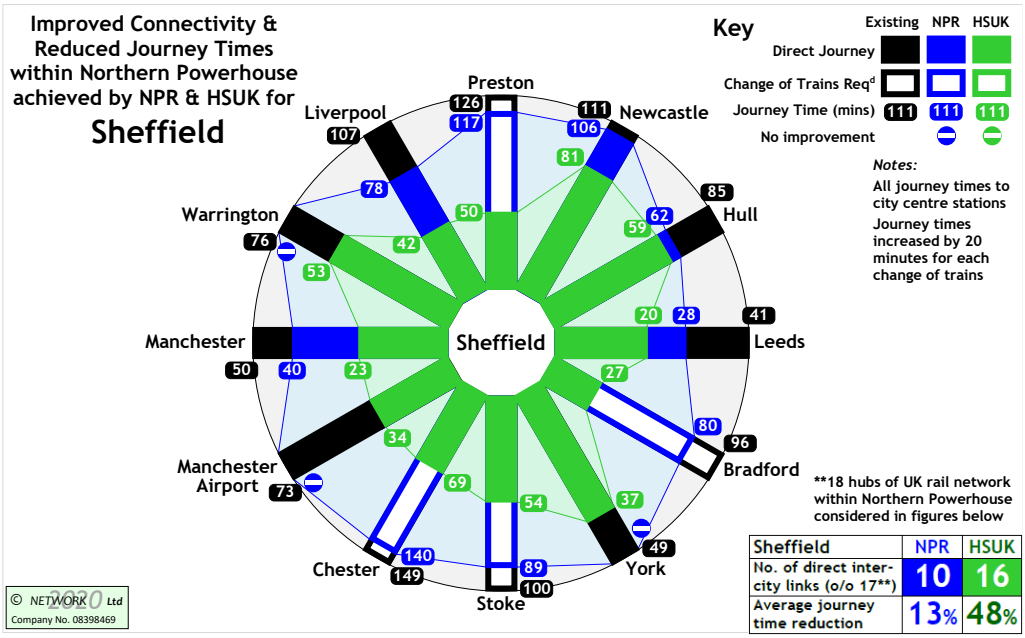
Journey Time Reductions Index to City Data

Doncaster	G.04	Stoke	G.13
Sheffield	G.05	Crewe	G.14
Huddersfield	G.06	Chester	G.15
Bradford	G.07	Stockport	G.16
Leeds	G.08	Manchester Airport	G.17
Hull	G.09	Manchester	G.18
York	G.10	Warrington	G.19
Darlington	G.11	Preston	G.20
Newcastle	G.12	Liverpool	G.21

G.03



G.04


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Sheffield
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Preston
Newcastle
Hull
Leeds
Bradford
York
Stoke
Chester
Manchester Airport
Manchester
Warrington
Liverpool
Sheffield
126 117 111 106 81 85 62 59 41 28 20 27 80 96 37 49 89 100 140 149 69 34 73 54 23 40 50 53 42 76 78 107
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Sheffield | NPR | HSUK
No. of direct inter-city links (o/o 17**) | 10 | 16
Average journey time reduction | 13% | 48%
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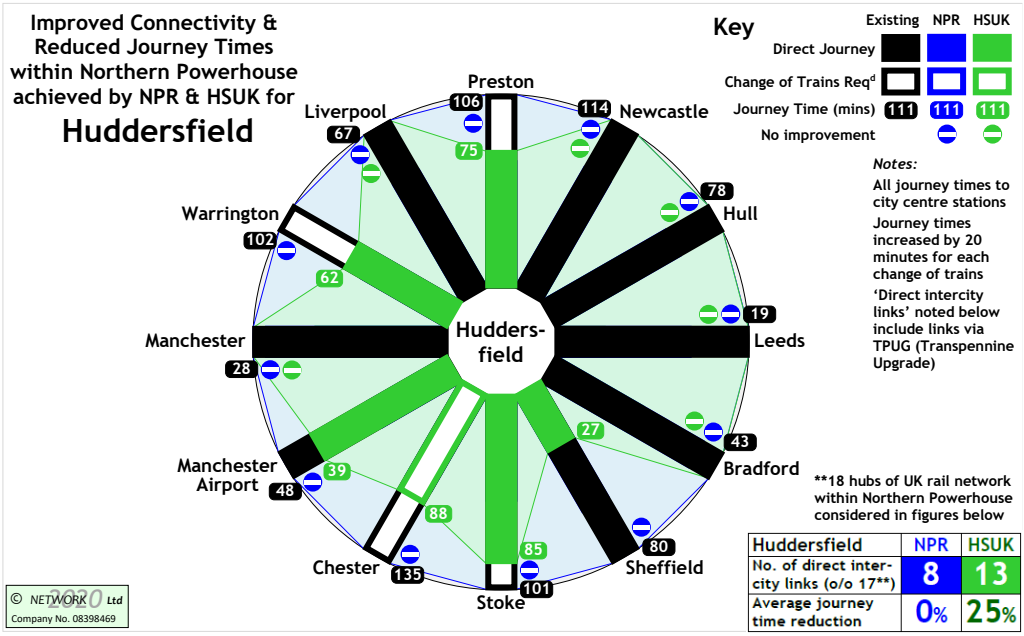
G.05


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Huddersfield
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
'Direct intercity links' noted below include links via TPUG (Transpennine Upgrade)
Preston
Newcastle
Hull
Leeds
Bradford
Sheffield
Stoke
Chester
Manchester Airport
Manchester
Warrington
Liverpool
Hudders-field
106 114 78 19 43 80 101 135 88 39 48 85 27 62 28 102 75 67
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Huddersfield | NPR | HSUK
No. of direct inter-city links (o/o 17**) | 8 | 13
Average journey time reduction | 0% | 25%
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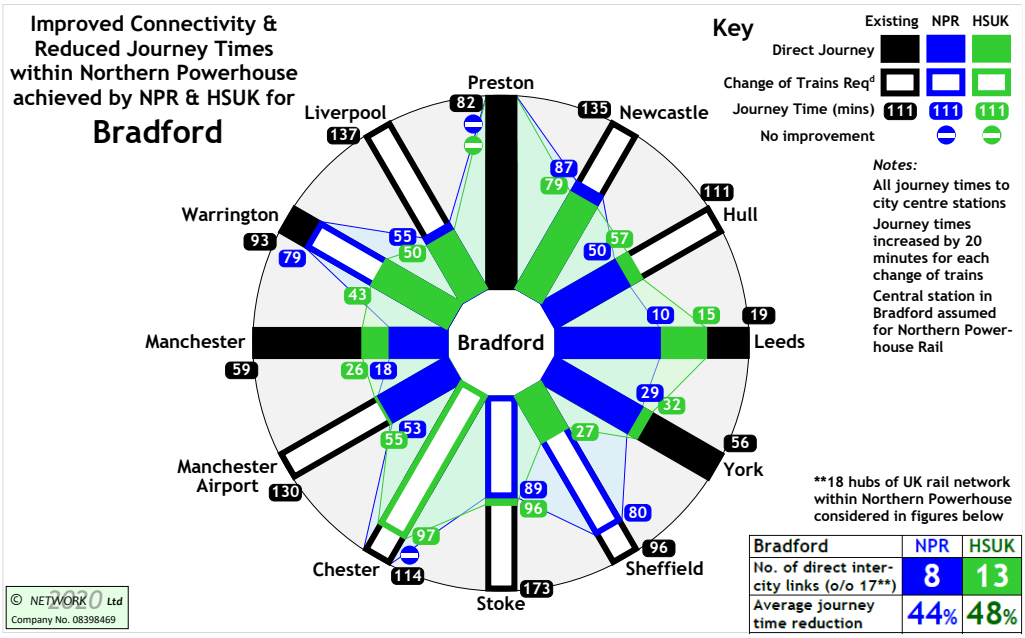
G.06


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Bradford
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Central station in Bradford assumed for Northern Powerhouse Rail
Preston
Newcastle
Hull
Leeds
York
Sheffield
Stoke
Chester
Manchester Airport
Manchester
Warrington
Liverpool
Bradford
82
135
111
19
56
96
173
114
130
59
93
137
87
79
57
50
10
15
29
32
27
89
96
80
97
53
55
26
18
55
50
43
79
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Bradford NPR HSUK
No. of direct inter-city links (o/o 17**) 8 13
Average journey time reduction 44% 48%
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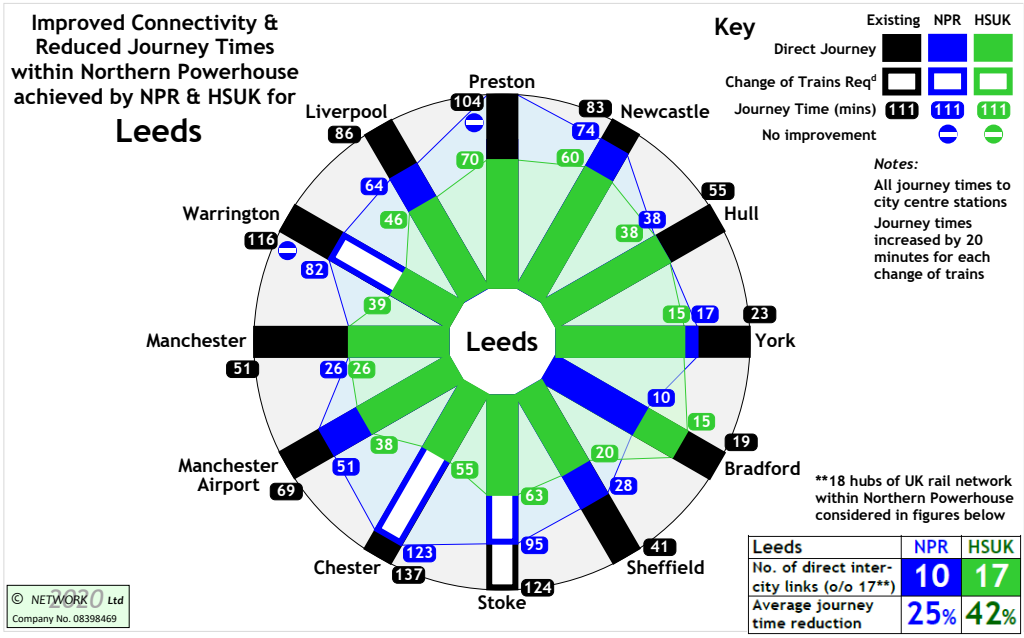
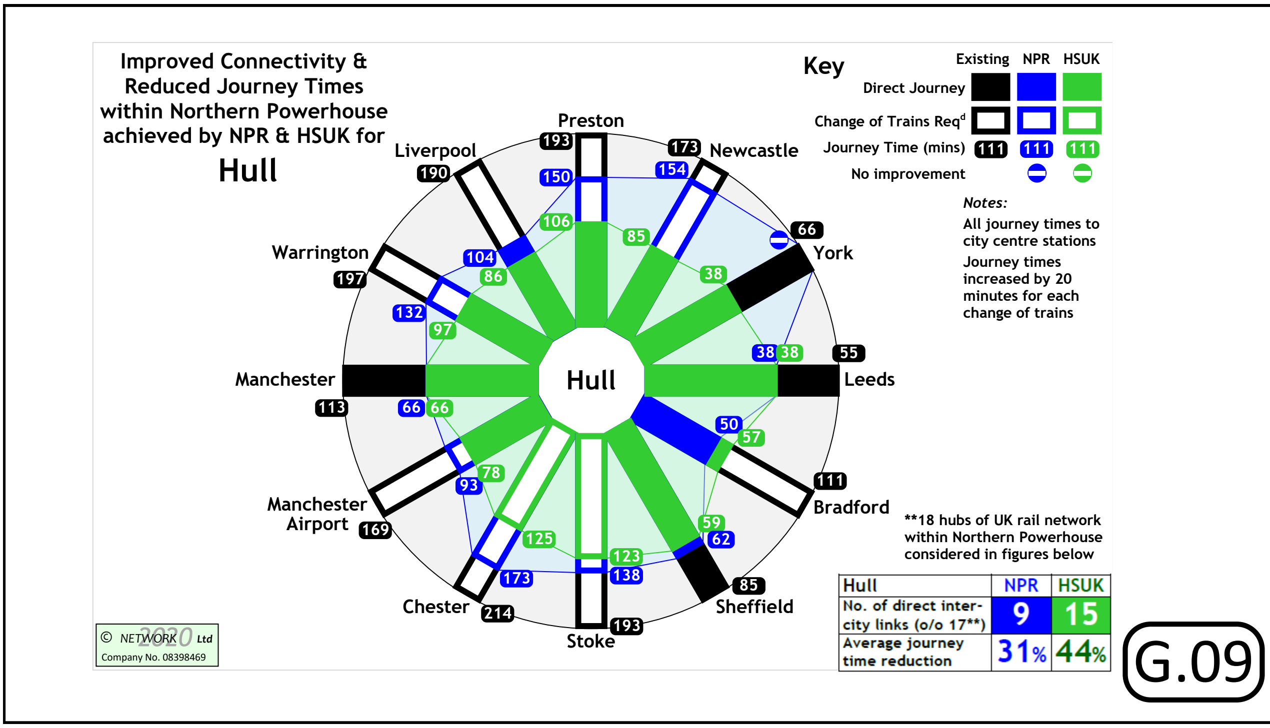
Company No. 08398469
G.07


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Leeds
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Preston
Newcastle
Hull
York
Bradford
Sheffield
Stoke
Chester
Manchester Airport
Manchester
Warrington
Liverpool
Leeds
104
83
55
23
19
41
124
137
69
51
116
86
74
60
38
38
15
17
10
15
20
28
63
95
123
55
51
38
26
26
39
82
64
46
70
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Leeds NPR HSUK
No. of direct inter-city links (o/o 17**) 10 17
Average journey time reduction 25% 42%
© NETWORK 2020 Ltd
Company No. 08398469
G.08


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Hull
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Preston 193 150 106
Newcastle 173 154 85
York 66 38
Leeds 55 38 38
Bradford 111 50 57
Sheffield 85 62 59
Stoke 193 138 123
Chester 214 173 125
Manchester Airport 169 93 78
Manchester 113 66 66
Warrington 197 132 97
Liverpool 190 104 86
Hull
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Hull | NPR | HSUK
No. of direct inter-city links (o/o 17**) | 9 | 15
Average journey time reduction | 31% | 44%
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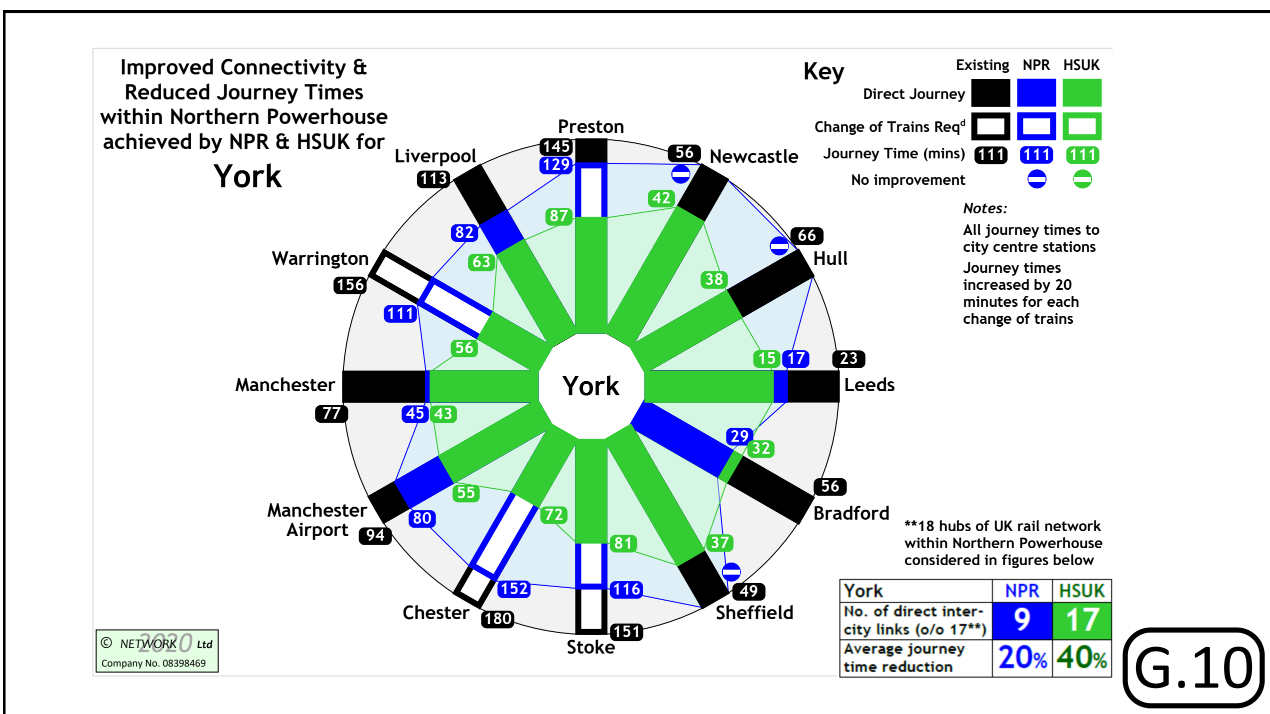
G.09


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
York
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Preston 145 129 87
Newcastle 56 42
Hull 66 38
Leeds 23 17 15
Bradford 56 29 32
Sheffield 49 37
Stoke 151 116 81
Chester 180 152 72
Manchester Airport 94 80 55
Manchester 77 45 43
Warrington 156 111 56
Liverpool 113 82 63
York
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
York | NPR | HSUK
No. of direct inter-city links (o/o 17**) | 9 | 17
Average journey time reduction | 20% | 40%
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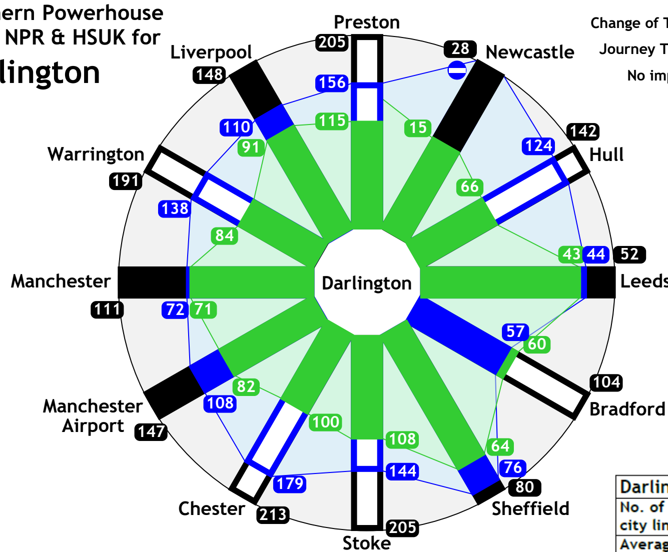
G.10

Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for

Darlington



Key

	Existing	NPR	HSUK
Direct Journey			
Change of Trains Req[d]			
Journey Time (mins)	111	111	111
No improvement			

Notes:

All journey times to city centre stations

Journey times increased by 20 minutes for each change of trains

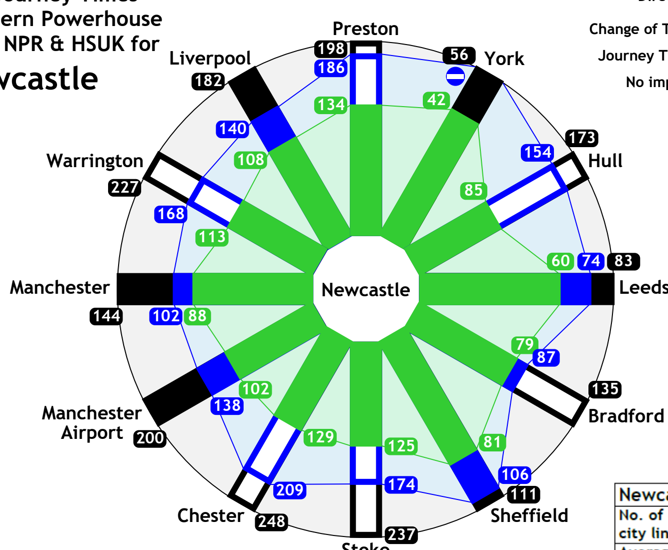
**18 hubs of UK rail network within Northern Powerhouse considered in figures below

Darlington	NPR	HSUK
No. of direct inter-city links (o/o 17**)	9	17
Average journey time reduction	21%	39%

G.11

Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for

Newcastle



Key

	Existing	NPR	HSUK
Direct Journey			
Change of Trains Req[d]			
Journey Time (mins)	111	111	111
No improvement			

Notes:

All journey times to city centre stations

Journey times increased by 20 minutes for each change of trains

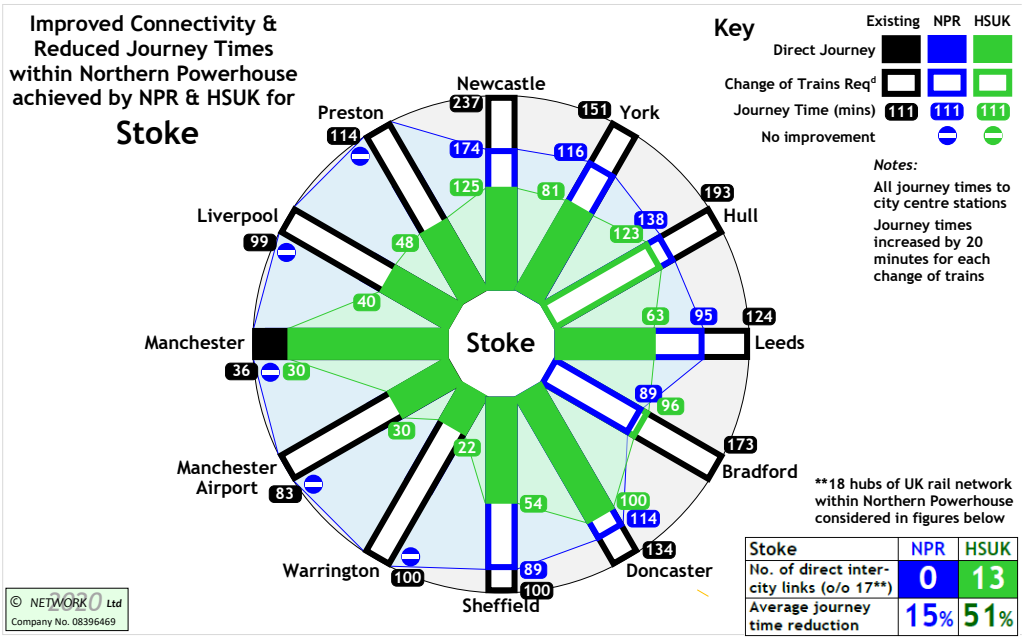
HSUK journey times to Newcastle include savings from new high speed line in County Durham

Latest TfN info (Nov 2020) confirms no plans for new NPR route in North-East

**18 hubs of UK rail network within Northern Powerhouse considered in figures below

Newcastle	NPR	HSUK
No. of direct inter-city links (o/o 17**)	9	17
Average journey time reduction	18%	40%

G.12


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Stoke
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Newcastle
York
Hull
Leeds
Bradford
Doncaster
Sheffield
Warrington
Manchester Airport
Manchester
Liverpool
Preston
Stoke
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Stoke | NPR | HSUK
No. of direct inter-city links (o/o 17**) | 0 | 13
Average journey time reduction | 15% | 51%
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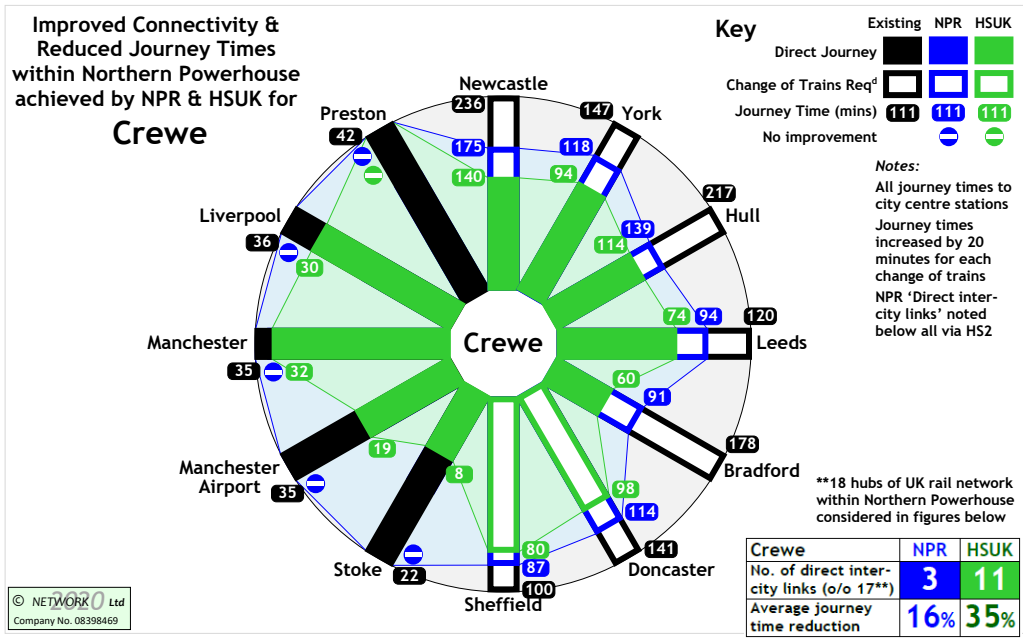
G.13


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Crewe
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
NPR 'Direct inter-city links' noted below all via HS2
Newcastle
York
Hull
Leeds
Bradford
Doncaster
Sheffield
Stoke
Manchester Airport
Manchester
Liverpool
Preston
Crewe
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Crewe | NPR | HSUK
No. of direct inter-city links (o/o 17**) | 3 | 11
Average journey time reduction | 16% | 35%
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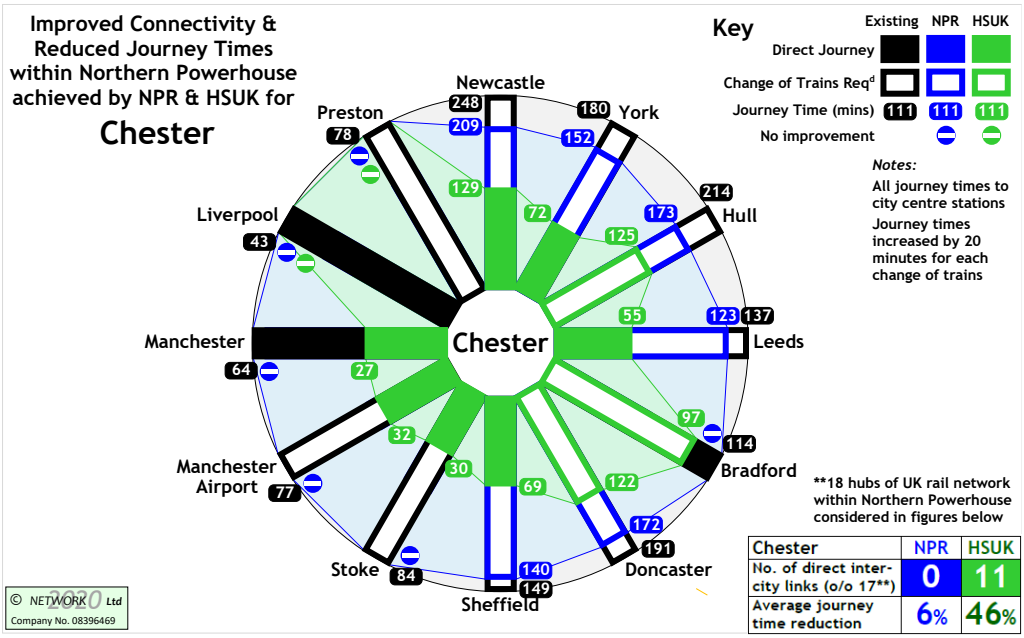
G.14


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Chester
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Newcastle
Preston
York
Liverpool
Hull
Manchester
Chester
Leeds
Manchester Airport
Bradford
Stoke
Doncaster
Sheffield
248 209 180 152 78 129 72 214 173 125 43 55 123 137 64 27 97 114 32 30 69 122 77 172 191 84 140 149
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Chester | NPR | HSUK
No. of direct inter-city links (o/o 17**) | 0 | 11
Average journey time reduction | 6% | 46%
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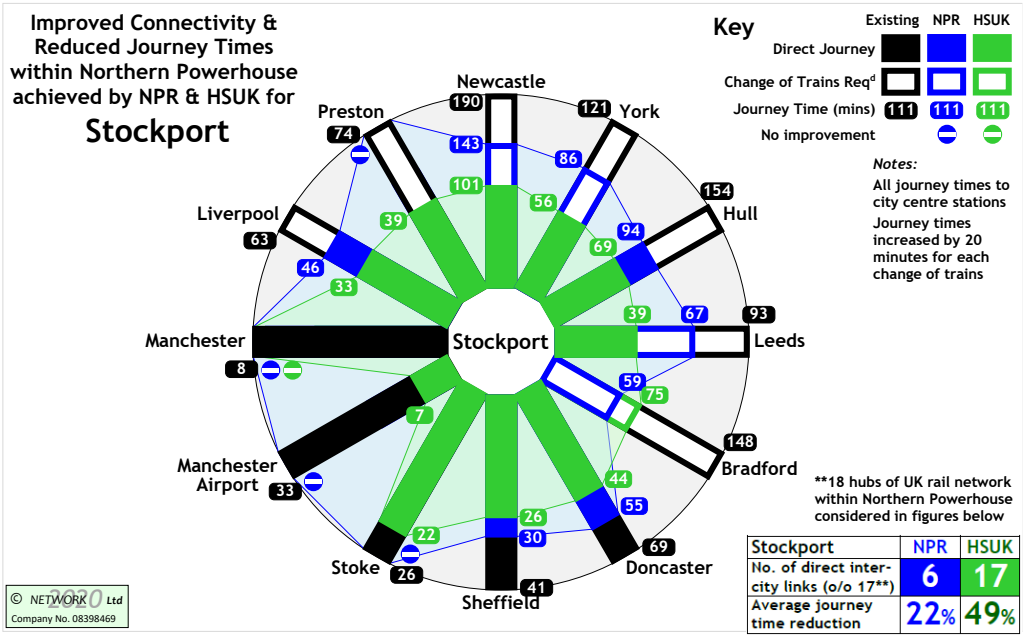
G.15


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Stockport
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Newcastle
Preston
York
Liverpool
Hull
Manchester
Stockport
Leeds
Manchester Airport
Bradford
Stoke
Doncaster
Sheffield
190 143 121 86 74 101 56 154 39 94 63 69 46 33 39 67 93 8 59 75 7 148 33 44 55 26 22 30 69 26 41
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Stockport | NPR | HSUK
No. of direct inter-city links (o/o 17**) | 6 | 17
Average journey time reduction | 22% | 49%
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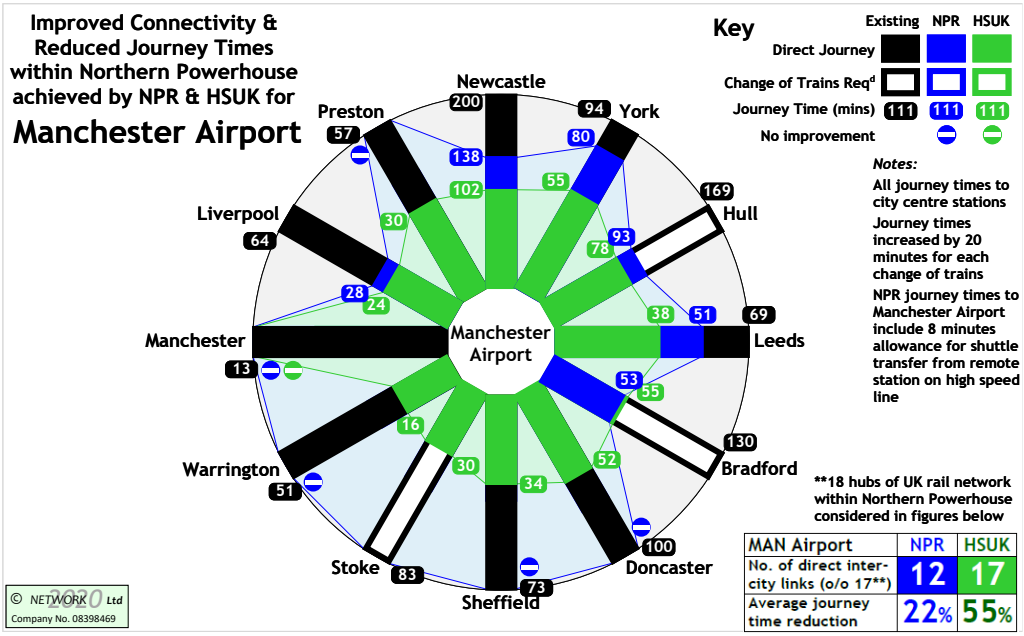
G.16


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Manchester Airport
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
NPR journey times to Manchester Airport include 8 minutes allowance for shuttle transfer from remote station on high speed line
Newcastle
York
Hull
Leeds
Bradford
Doncaster
Sheffield
Stoke
Warrington
Manchester
Liverpool
Preston
Manchester Airport
200
94
80
138
102
55
169
78
93
38
51
69
53
55
130
52
34
100
73
83
30
16
51
13
64
28
24
30
57
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
MAN Airport NPR HSUK
No. of direct inter-city links (o/o 17**) 12 17
Average journey time reduction 22% 55%
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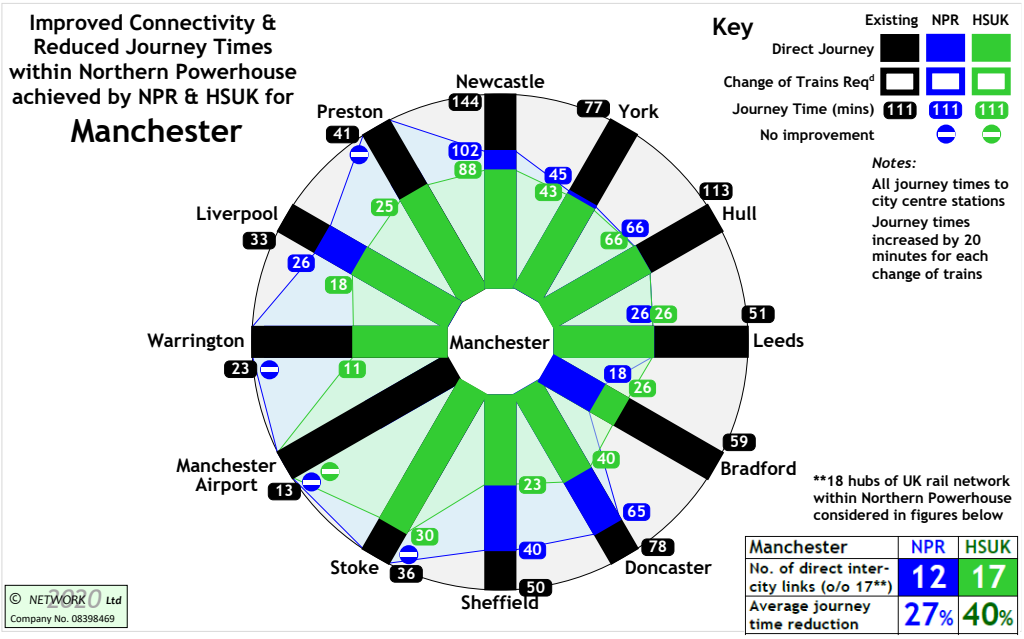
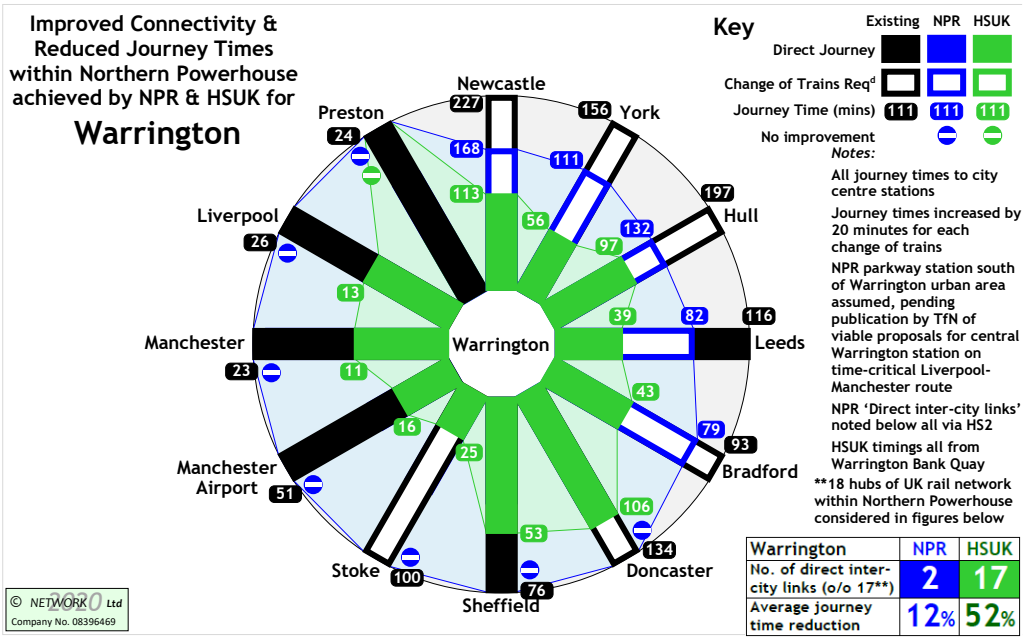
Company No. 08398469

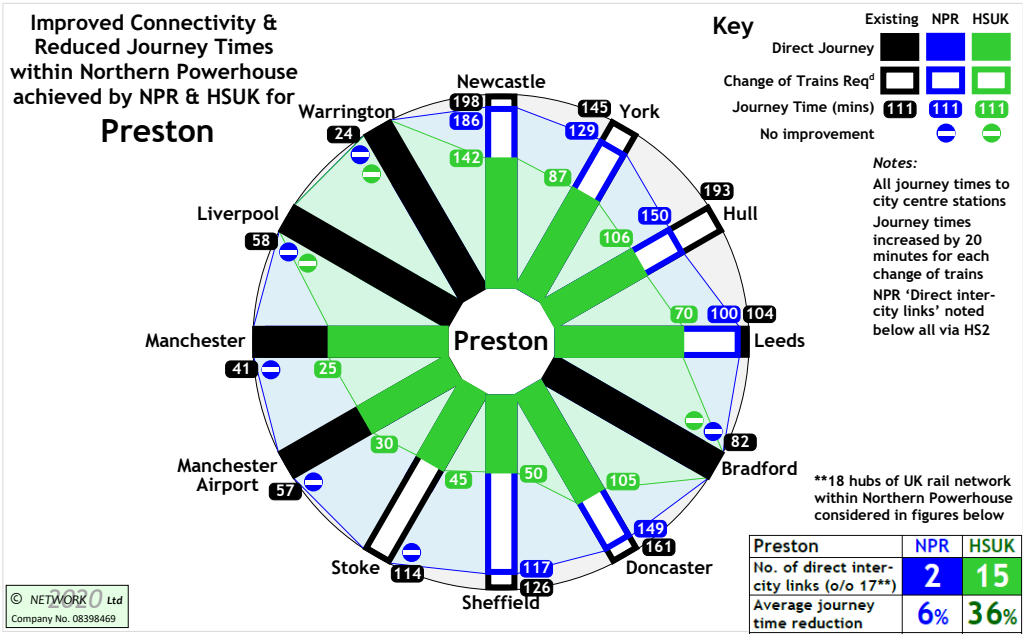
G.17


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Manchester
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Newcastle
York
Hull
Leeds
Bradford
Doncaster
Sheffield
Stoke
Manchester Airport
Warrington
Liverpool
Preston
Manchester
144
77
102
88
45
43
113
66
66
26
26
51
18
26
59
40
23
65
78
40
50
30
36
11
23
13
33
26
18
25
41
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Manchester NPR HSUK
No. of direct inter-city links (o/o 17**) 12 17
Average journey time reduction 27% 40%
© NETWORK 2020 Ltd
Company No. 08398469

G.18


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Warrington
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
NPR parkway station south of Warrington urban area assumed, pending publication by TfN of viable proposals for central Warrington station on time-critical Liverpool-Manchester route
NPR 'Direct inter-city links' noted below all via HS2
HSUK timings all from Warrington Bank Quay
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Warrington
Newcastle
Preston
York
Hull
Leeds
Bradford
Doncaster
Sheffield
Stoke
Manchester Airport
Manchester
Liverpool
227
24
156
197
116
93
134
76
100
51
23
26
168
113
111
56
132
97
82
39
43
79
106
53
16
25
11
13
Warrington NPR HSUK
No. of direct inter-city links (o/o 17**) 2 17
Average journey time reduction 12% 52%
© NETWORK 2030 Ltd
Company No. 08396469

G.19


Improved Connectivity & Reduced Journey Times within Northern Powerhouse achieved by NPR & HSUK for
Preston
Key
Existing NPR HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
NPR 'Direct inter-city links' noted below all via HS2
**18 hubs of UK rail network within Northern Powerhouse considered in figures below
Preston
Newcastle
Warrington
York
Hull
Leeds
Bradford
Doncaster
Sheffield
Stoke
Manchester Airport
Manchester
Liverpool
198
24
145
193
104
82
161
126
114
57
41
58
186
142
129
87
150
106
100
70
105
50
45
30
25
Preston NPR HSUK
No. of direct inter-city links (o/o 17**) 2 15
Average journey time reduction 6% 36%
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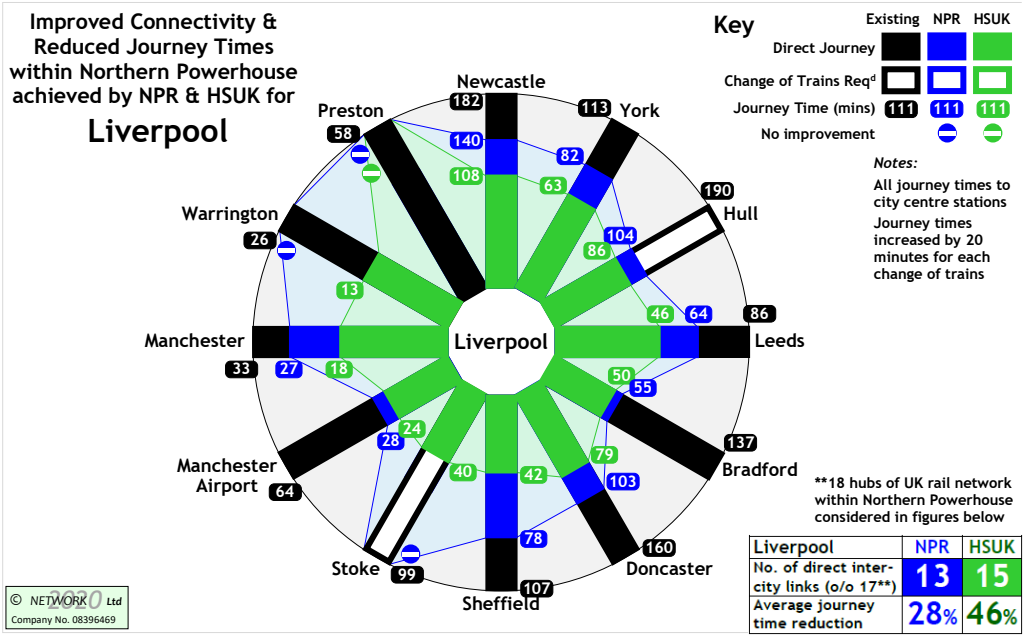
Company No. 08398469

G.20



G.21

Overall Journey Time Reduction Performance HSUK

Averaged across 153 journeys interlinking 18 key Northern Powerhouse centres:

- NPR achieves 20% average JT reduction
- HSUK achieves 43% average JT reduction

G.22

Network Aims 4 & 5

4. Full integration between high speed & local services
5. Step-change capacity increase for local services

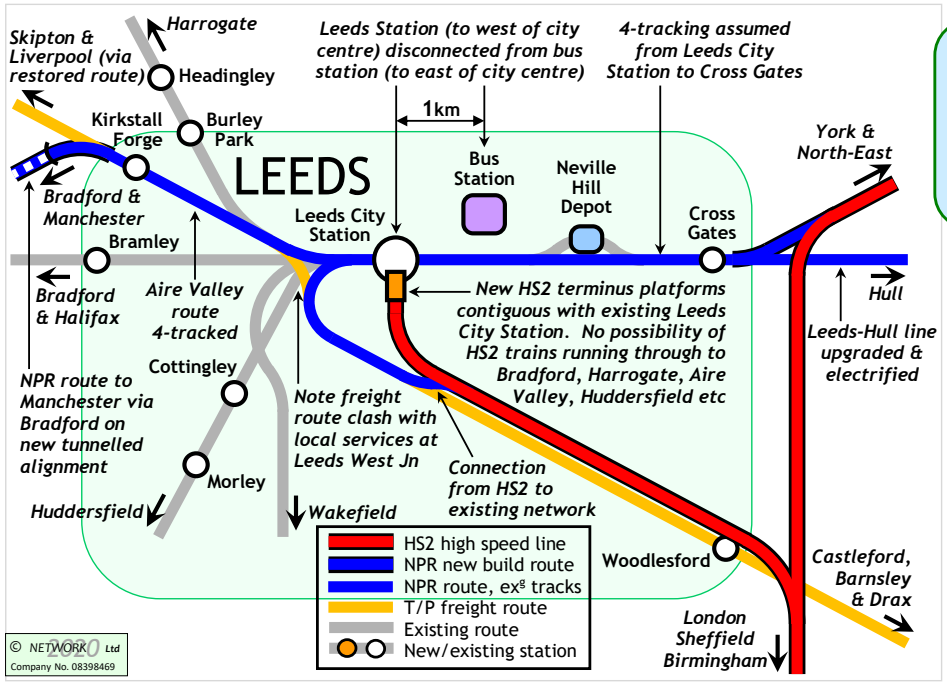
H.01

NPR Schemes for Northern Powerhouse Cities

H.03 Leeds
H.04 Central Manchester
H.05 Greater Manchester

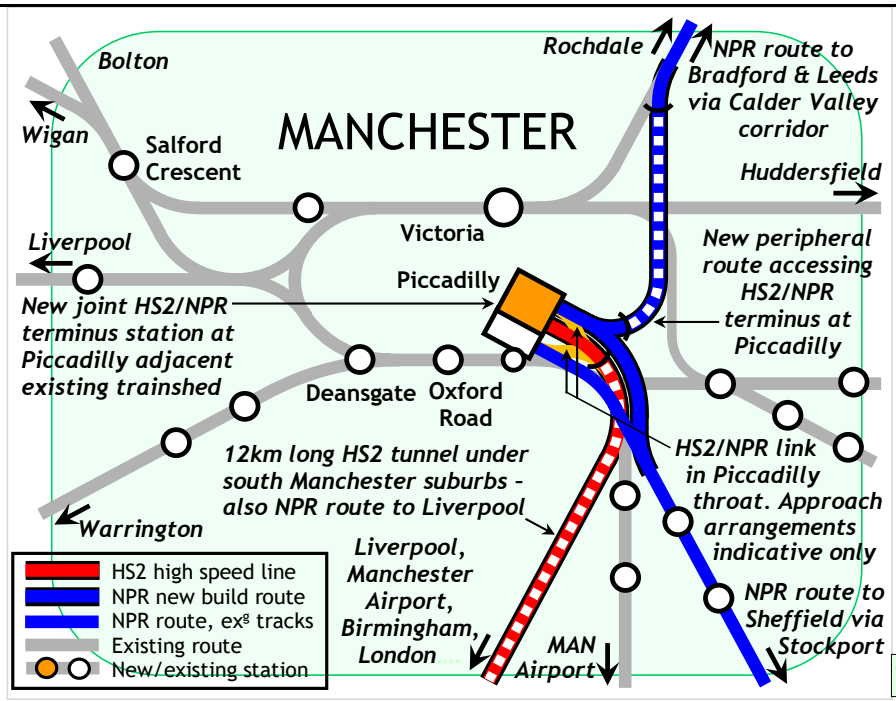
All compromised by lack of integration, dependency upon HS2 and reliance upon unfit-for-purpose terminus and parkway stations in Leeds and Manchester

H.02



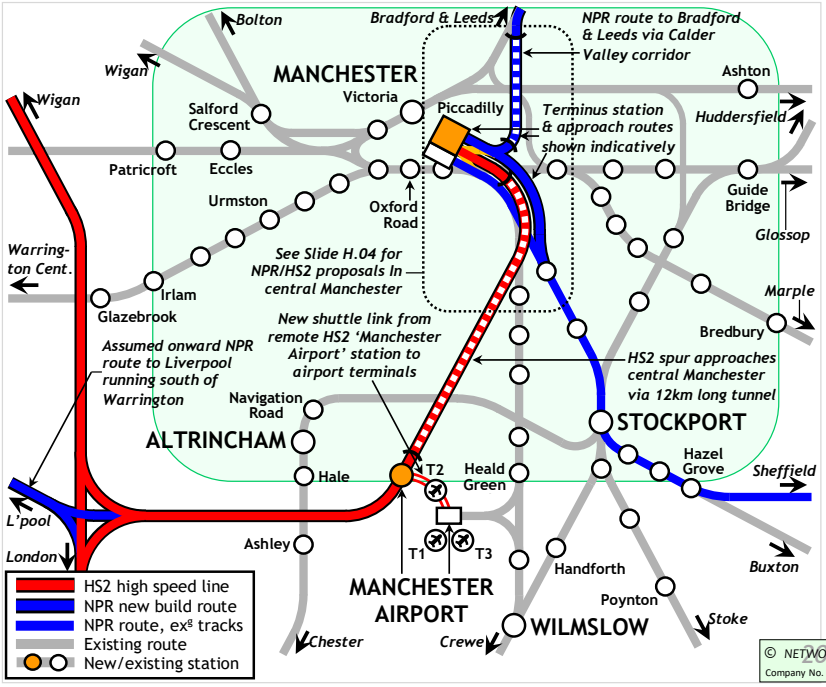
Assumed NPR Scheme for Improved Rail Infrastructure in Leeds

H.03



Assumed NPR Scheme for Improved Rail Infrastructure in Central Manchester

H.04



Assumed NPR Scheme for Improved Rail Infrastructure in Greater Manchester

H.05

HSUK Schemes for Northern Powerhouse Cities

HSUK schemes represented as follows:

- Scale plan showing proposed HSUK city centre station in relation to other infrastructure;
- Scheme plan illustrating proposed HSUK works;
- Diagram showing potential step-change increase in local services enabled by proposed HSUK works.

I.01

HSUK Schemes for Northern Powerhouse Cities

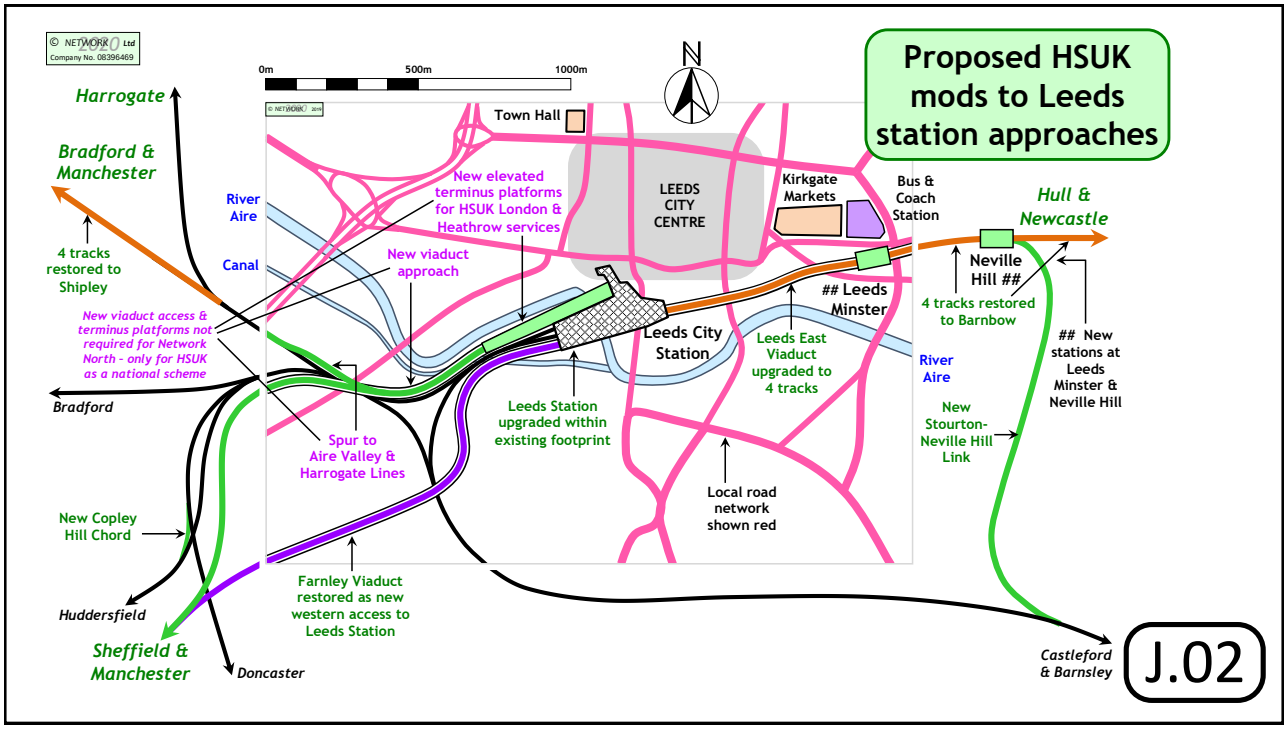
J.01 Leeds & Bradford
K.01 Sheffield City Region
L.01 Manchester & Manchester Airport
M.01 Liverpool
N.01 Stoke/Potteries

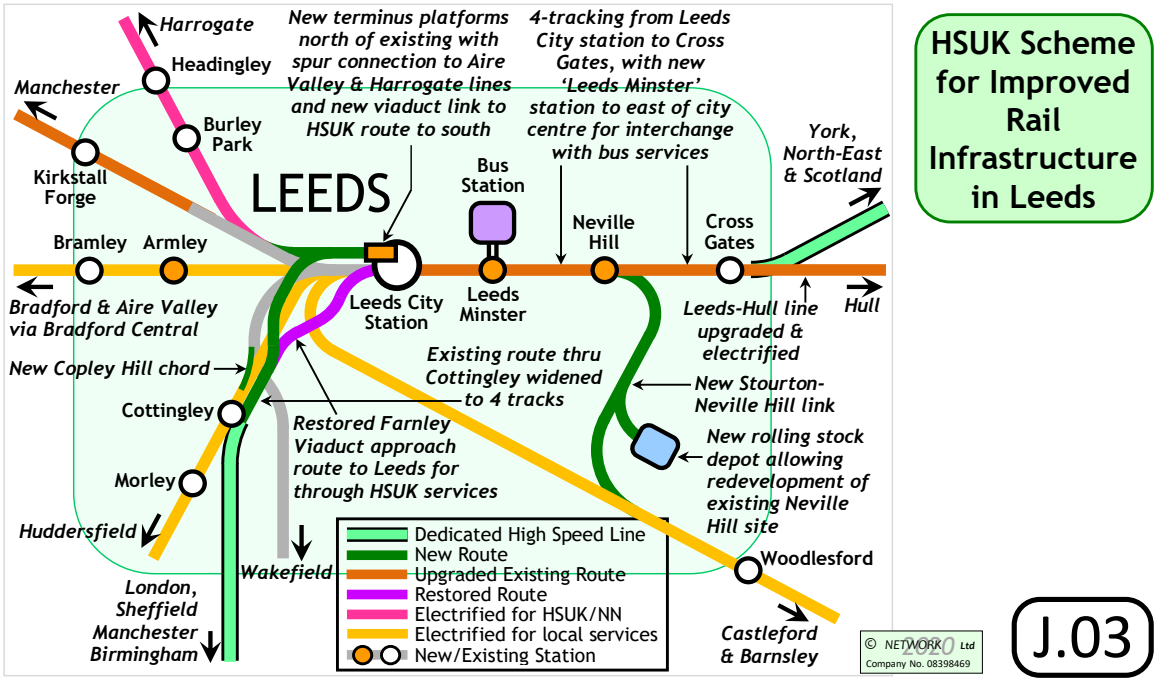
I.02

Leeds

- Network North will serve Leeds at the existing Leeds City Station.
- Dedicated HS route created through Leeds, with Farnley viaduct restored & route to east 4-tracked.
- New Stourton-Neville Hill link to reduce termination at Leeds and increase capacity.
- New station at Leeds Minster for interchange with Leeds Bus/Coach station.
- Capacity for local services approx doubled.

J.01


Proposed HSUK mods to Leeds station approaches
© NETWORK 2020 Ltd Company No. 08396469
0m
500m
1000m
N
Harrogate
Bradford & Manchester
4 tracks restored to Shipley
River Aire
Canal
New elevated terminus platforms for HSUK London & Heathrow services
New viaduct approach
New viaduct access & terminus platforms not required for Network North - only for HSUK as a national scheme
Bradford
Spur to Aire Valley & Harrogate Lines
Town Hall
LEEDS CITY CENTRE
Kirkgate Markets
Bus & Coach Station
Hull & Newcastle
Neville Hill ##
4 tracks restored to Barnbow
Leeds Minster
Leeds City Station
Leeds East Viaduct upgraded to 4 tracks
New stations at Leeds Minster & Neville Hill
River Aire
New Stourton-Neville Hill Link
Leeds Station upgraded within existing footprint
Local road network shown red
New Copley Hill Chord
Huddersfield
Farnley Viaduct restored as new western access to Leeds Station
Sheffield & Manchester
Doncaster
Castleford & Barnsley
J.02


HSUK Scheme for Improved Rail Infrastructure in Leeds
Harrogate
Headingley
Manchester
Burley Park
Kirkstall Forge
LEEDS
New terminus platforms north of existing with spur connection to Aire Valley & Harrogate lines and new viaduct link to HSUK route to south
4-tracking from Leeds City station to Cross Gates, with new 'Leeds Minster' station to east of city centre for interchange with bus services
Bus Station
Neville Hill
Cross Gates
York, North-East & Scotland
Bramley
Armley
Bradford & Aire Valley via Bradford Central
Leeds City Station
Leeds Minster
Hull
Leeds-Hull line upgraded & electrified
New Copley Hill chord
Existing route thru Cottingley widened to 4 tracks
New Stourton-Neville Hill link
Cottingley
Restored Farnley Viaduct approach route to Leeds for through HSUK services
New rolling stock depot allowing redevelopment of existing Neville Hill site
Morley
Huddersfield
Wakefield
Woodlesford
London, Sheffield Manchester Birmingham
Castleford & Barnsley
Dedicated High Speed Line
New Route
Upgraded Existing Route
Restored Route
Electrified for HSUK/NN
Electrified for local services
New/Existing Station
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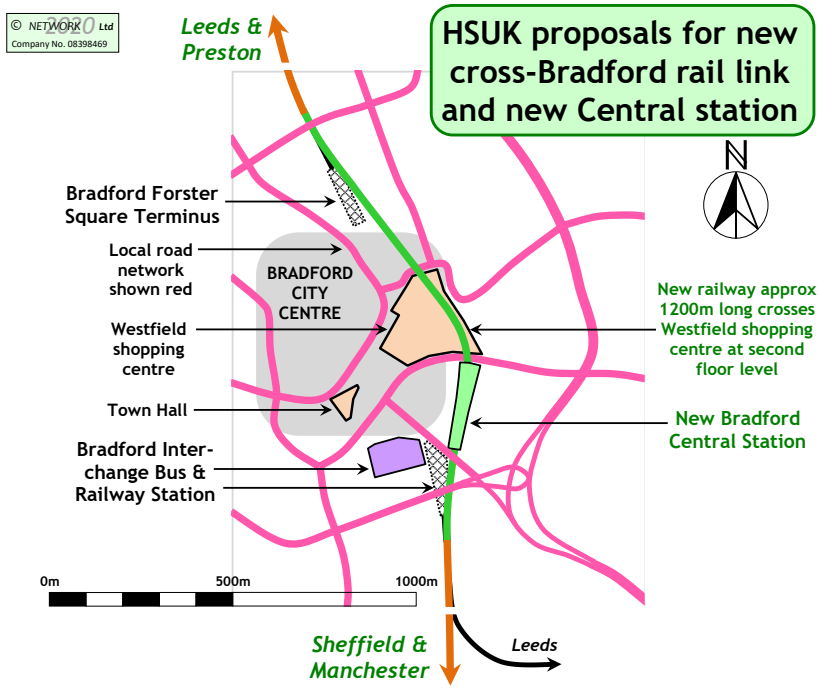
J.03

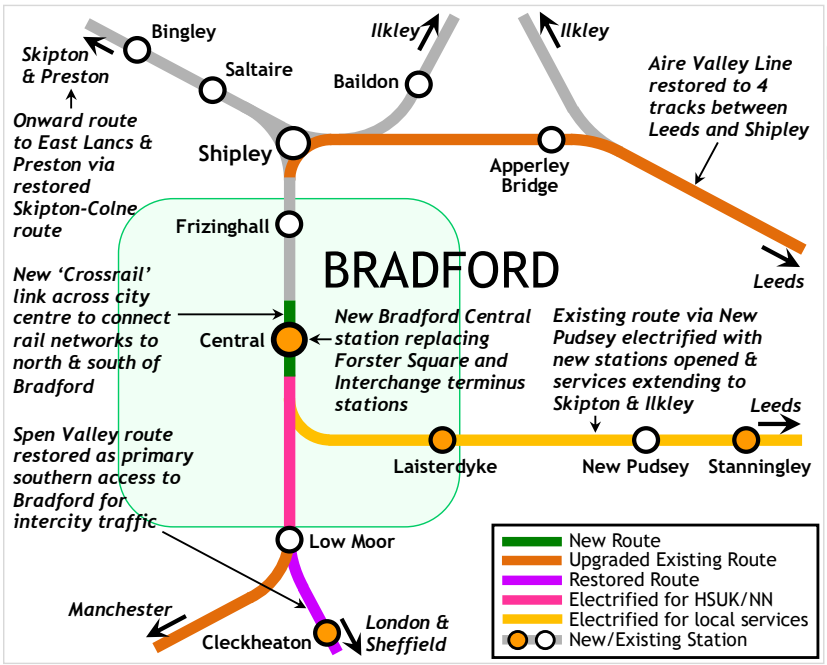
Bradford

- Network North will serve Bradford at the new Bradford Central Station.
- This will be located on new 1.2km cross-city link, connecting networks to north & south of Bradford.
- With existing terminus stations eliminated, local & intercity services can cross the city e.g. London & Sheffield via Bradford to Skipton, Burnley, Preston.
- Local rail networks in Leeds, Bradford, Aire Valley & Calder Valley fully integrated.

J.04

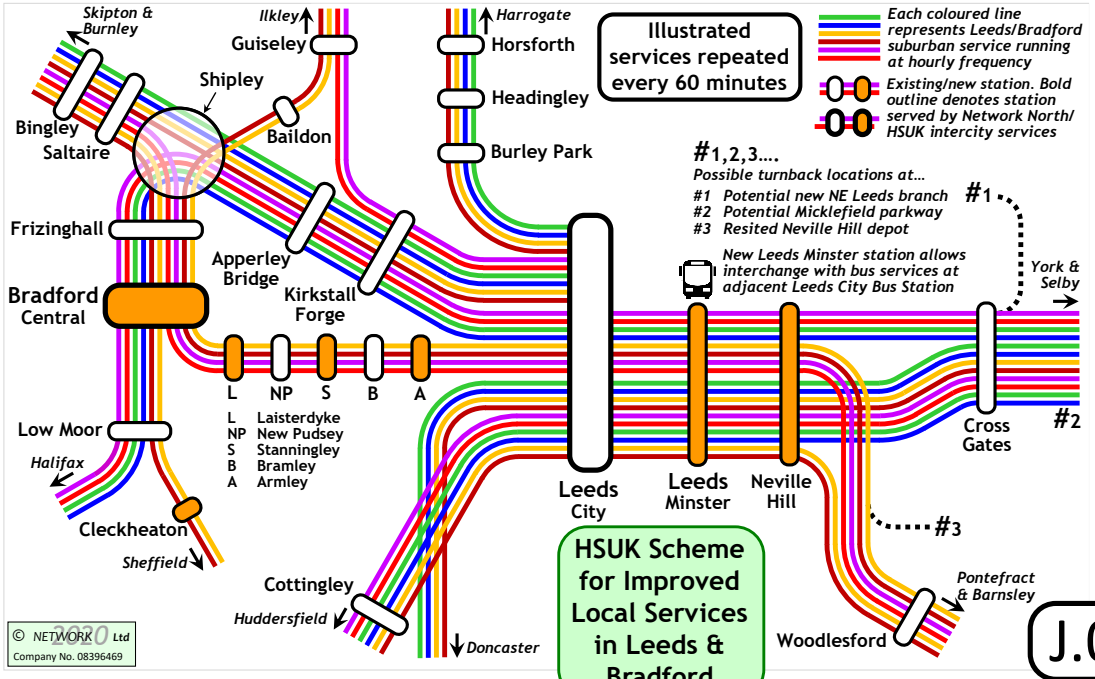


J.05



HSUK Scheme for Improved Rail Infrastructure in Bradford

J.06

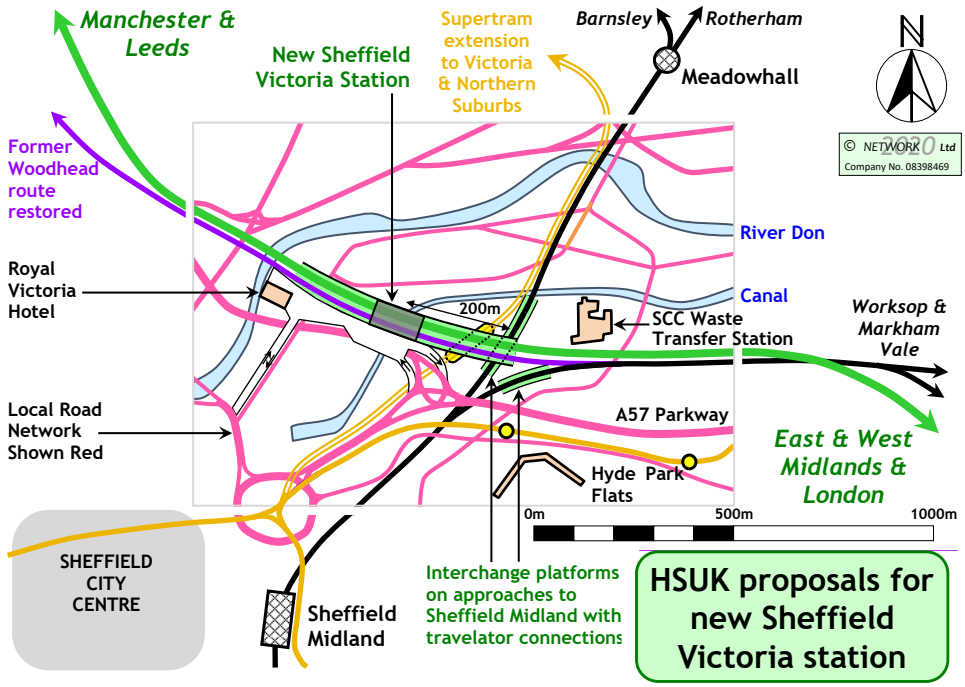


J.07

Sheffield

- Network North will serve Sheffield at a new station on the site of the former Sheffield Victoria station.
- This will form Sheffield's new rail hub, integrating high speed intercity services at the high level platforms and local services at low level platforms on the existing approaches to Sheffield Midland.
- Proposed HSUK works will enable establishment of greatly improved local services on all radial routes into Sheffield.

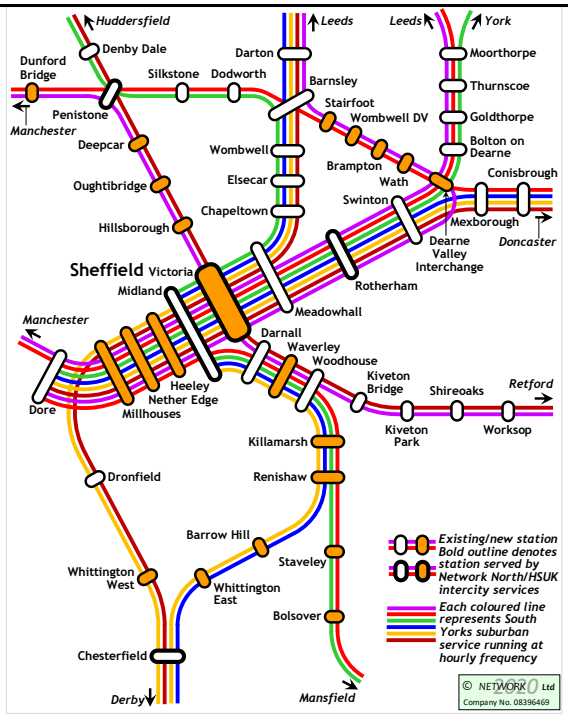
K.01



K.02

HSUK Scheme for Improved Rail Infrastructure in Sheffield City Region

K.03



HSUK Scheme for Improved Local Services in Sheffield City Region

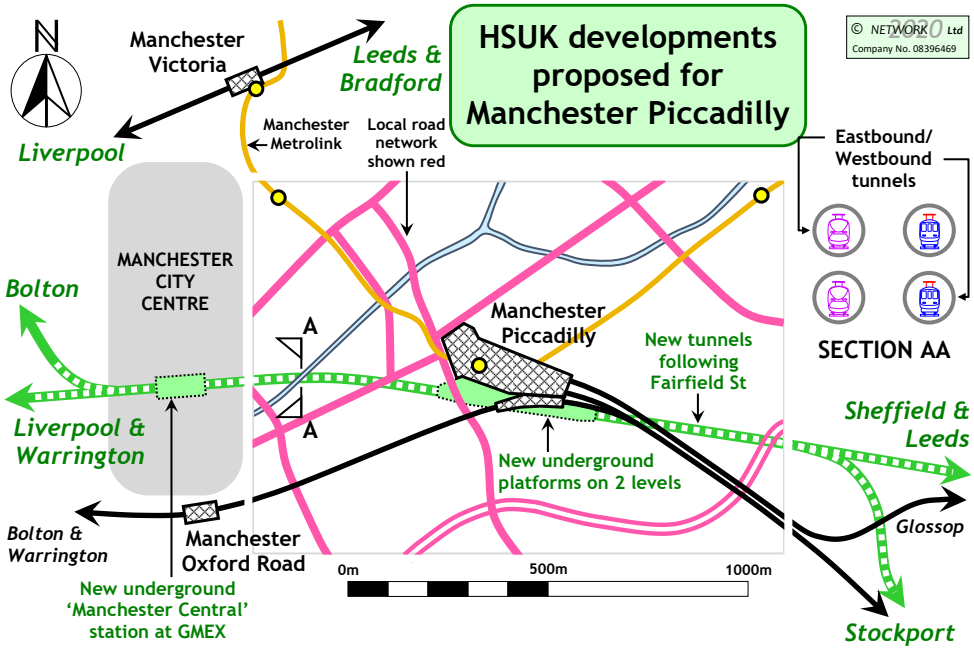
Illustrated services repeated every 60 minutes

K.04

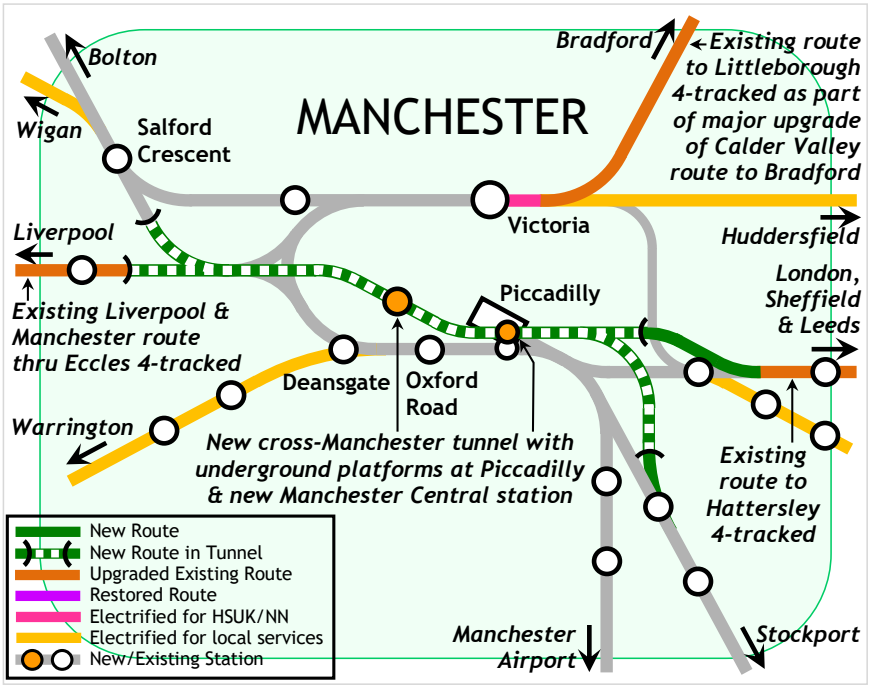
Manchester

- Network North will serve Manchester at new underground platforms below Piccadilly station.
- New tunnel – comprising 4 tracks – will connect to HSUK routes to Yorkshire and Liverpool, and also to existing routes to Stockport and Bolton.
- New tunnel provides new east-west route for local services, additional to existing Castlefield Corridor.
- New underground 'Manchester Central' station for local services.

L.01



L.02



HSUK Scheme for Improved Rail Infrastructure in Central Manchester

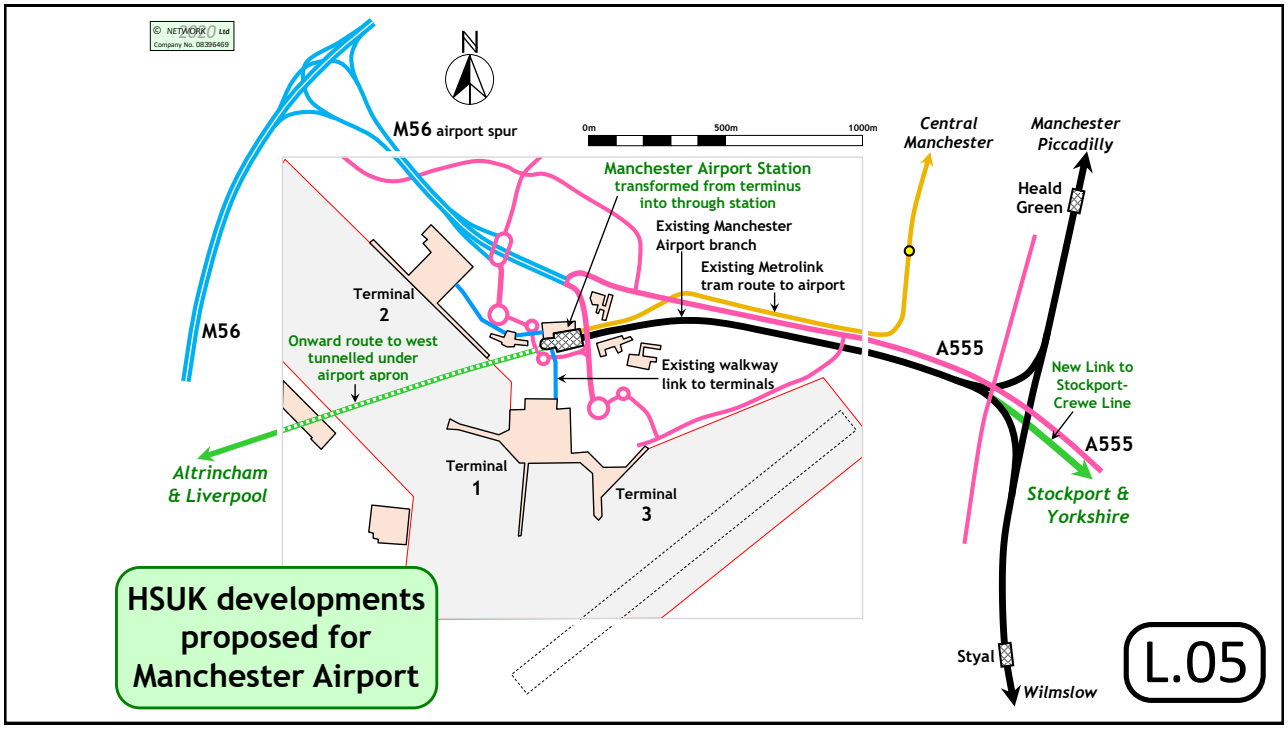
L.03

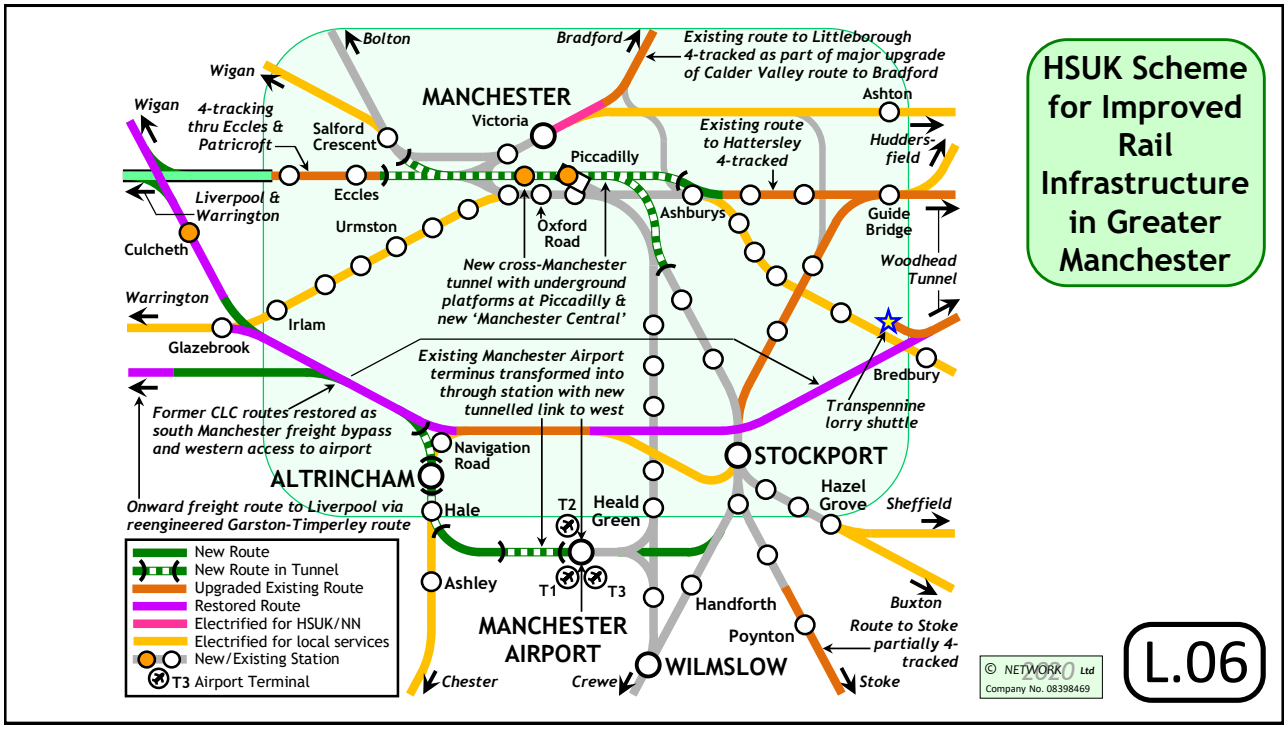
Manchester Airport

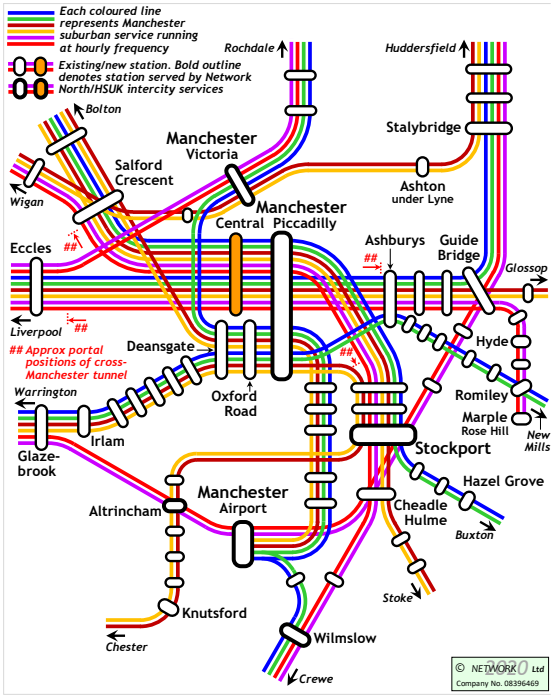
HSUK

- Network North will serve Manchester Airport at its existing terminus station.
- This station will be transformed into a through station, with a new tunnelled route continuing west under the airport apron.
- This will form part of a south Manchester loop, extending west via Altrincham towards Liverpool and east via Stockport towards Yorkshire.
- Direct services to all major Northern cities.

L.04


© NETWORK Ltd Company No. 08396469
N
M56 airport spur
0m
500m
1000m
Central Manchester
Manchester Piccadilly
Heald Green
Manchester Airport Station transformed from terminus into through station
Existing Manchester Airport branch
Existing Metrolink tram route to airport
Terminal 2
M56
Onward route to west tunnelled under airport apron
Existing walkway link to terminals
A555
New Link to Stockport-Crewe Line
A555
Terminal 1
Terminal 3
Altrincham & Liverpool
Stockport & Yorkshire
Styal
Wilmslow
HSUK developments proposed for Manchester Airport
L.05


Bolton
Bradford
Existing route to Littleborough 4-tracked as part of major upgrade of Calder Valley route to Bradford
Wigan
MANCHESTER
Victoria
Ashton
Wigan
4-tracking thru Eccles & Patricroft
Salford Crescent
Piccadilly
Existing route to Hattersley 4-tracked
Hudders-field
Eccles
Liverpool & Warrington
Ashburys
Guide Bridge
Culcheth
Urmston
Oxford Road
New cross-Manchester tunnel with underground platforms at Piccadilly & new 'Manchester Central'
Woodhead Tunnel
Warrington
Irlam
Glazebrook
Existing Manchester Airport terminus transformed into through station with new tunnelled link to west
Bredbury
Transpennine lorry shuttle
Former CLC routes restored as south Manchester freight bypass and western access to airport
Navigation Road
STOCKPORT
ALTRINCHAM
Hazel Grove
Sheffield
Onward freight route to Liverpool via reengineered Garston-Timperley route
Hale
T2
Heald Green
New Route
New Route in Tunnel
Upgraded Existing Route
Restored Route
Electrified for HSUK/NN
Electrified for local services
New/Existing Station
T3 Airport Terminal
Ashley
T1
T3
Handforth
Buxton
MANCHESTER AIRPORT
Poynton
Route to Stoke partially 4-tracked
Chester
Crewe
WILMSLOW
Stoke
© NETWORK Ltd Company No. 08398469
HSUK Scheme for Improved Rail Infrastructure in Greater Manchester
L.06



HSUK Scheme for Improved Local Services in Greater Manchester

Illustrated services repeated every 60 minutes

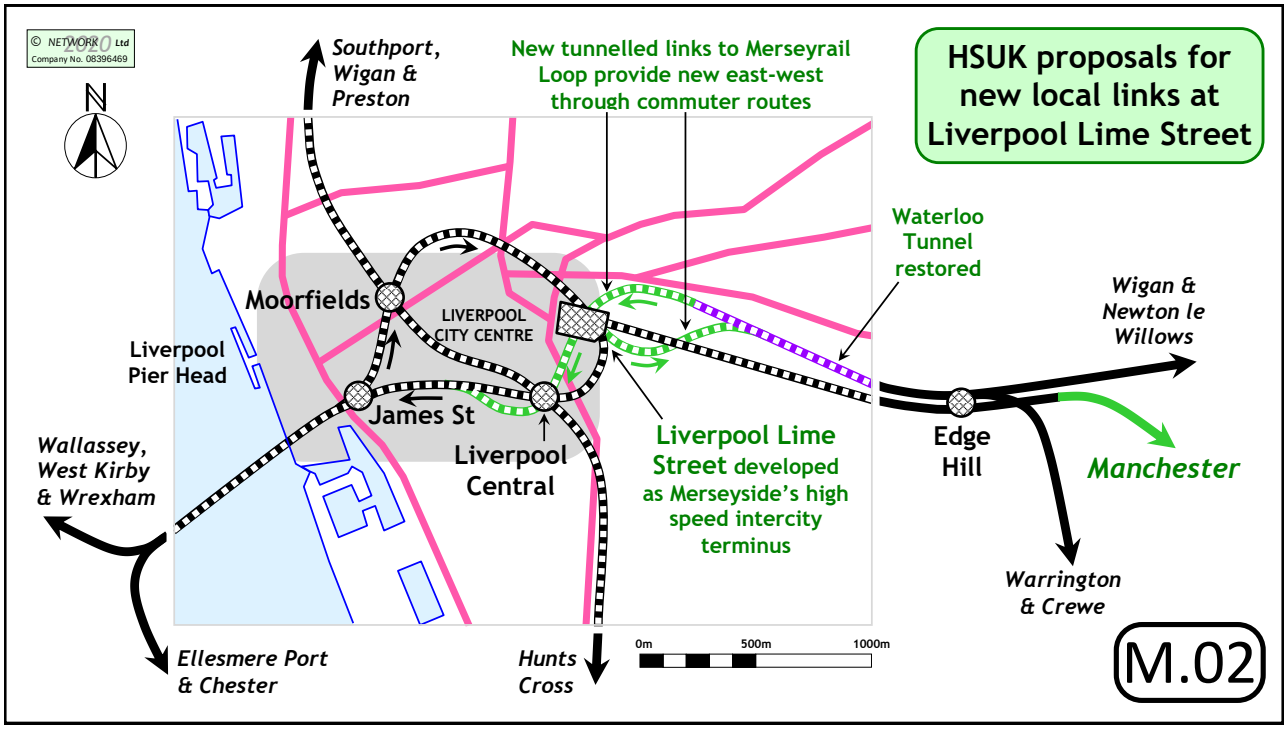
L.07

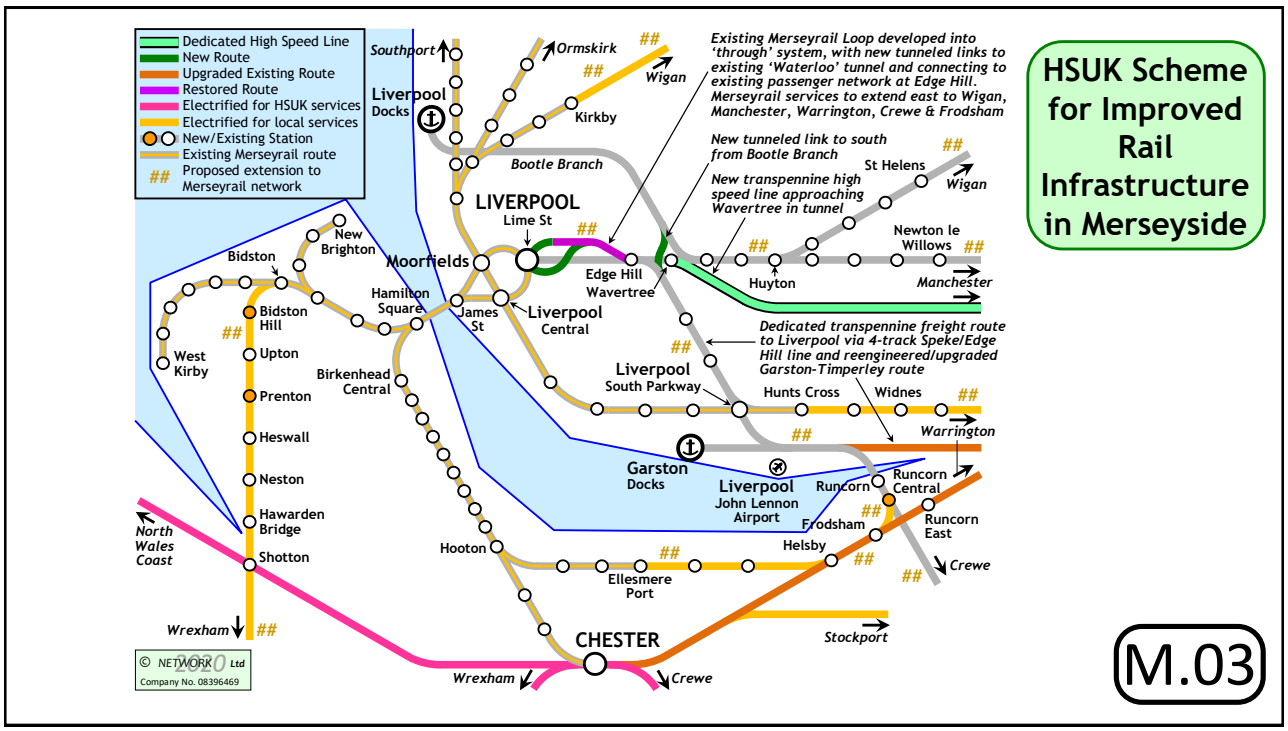
Liverpool

HSUK

- Network North will serve Liverpool at the existing Liverpool Lime Street station.
- Greatly increased range of intercity services from Liverpool leaves no platform space for local services to Wigan, Warrington etc.
- Local services diverted via restored ‘Waterloo Tunnel’ & new tunnels to existing Merseyrail Loop.
- This will enable new east-west (dual voltage) services linking through to Wirral.

M.01


© NETWORK Ltd
Company No. 08396469
HSUK proposals for new local links at Liverpool Lime Street
Southport, Wigan & Preston
New tunnelled links to Merseyrail Loop provide new east-west through commuter routes
Waterloo Tunnel restored
Wigan & Newton le Willows
Moorfields
LIVERPOOL CITY CENTRE
Liverpool Pier Head
James St
Liverpool Central
Liverpool Lime Street developed as Merseyside's high speed intercity terminus
Edge Hill
Manchester
Wallassey, West Kirby & Wrexham
Warrington & Crewe
Ellesmere Port & Chester
Hunts Cross
0m
500m
1000m
M.02


HSUK Scheme for Improved Rail Infrastructure in Merseyside
Dedicated High Speed Line
New Route
Upgraded Existing Route
Restored Route
Electrified for HSUK services
Electrified for local services
New/Existing Station
Existing Merseyrail route
Proposed extension to Merseyrail network
Existing Merseyrail Loop developed into 'through' system, with new tunneled links to existing 'Waterloo' tunnel and connecting to existing passenger network at Edge Hill. Merseyrail services to extend east to Wigan, Manchester, Warrington, Crewe & Frodsham
New tunneled link to south from Bootle Branch
New transpennine high speed line approaching Wavertree in tunnel
Dedicated transpennine freight route to Liverpool via 4-track Speke/Edge Hill line and reengineered/upgraded Garston-Timperley route
Southport
Ormskirk
Wigan
Kirkby
Liverpool Docks
Bootle Branch
LIVERPOOL Lime St
St Helens
Newton le Willows
Manchester
Huyton
Edge Hill
Wavertree
Moorfields
New Brighton
Bidston
Hamilton Square
James St
Liverpool Central
Bidston Hill
West Kirby
Upton
Prenton
Birkenhead Central
Heswall
Neston
Hawarden Bridge
Shotton
North Wales Coast
Liverpool South Parkway
Hunts Cross
Widnes
Warrington
Garston Docks
Liverpool John Lennon Airport
Runcorn
Runcorn Central
Runcorn East
Frodsham
Helsby
Crewe
Hooton
Ellesmere Port
Wrexham
CHESTER
Stockport
Crewe
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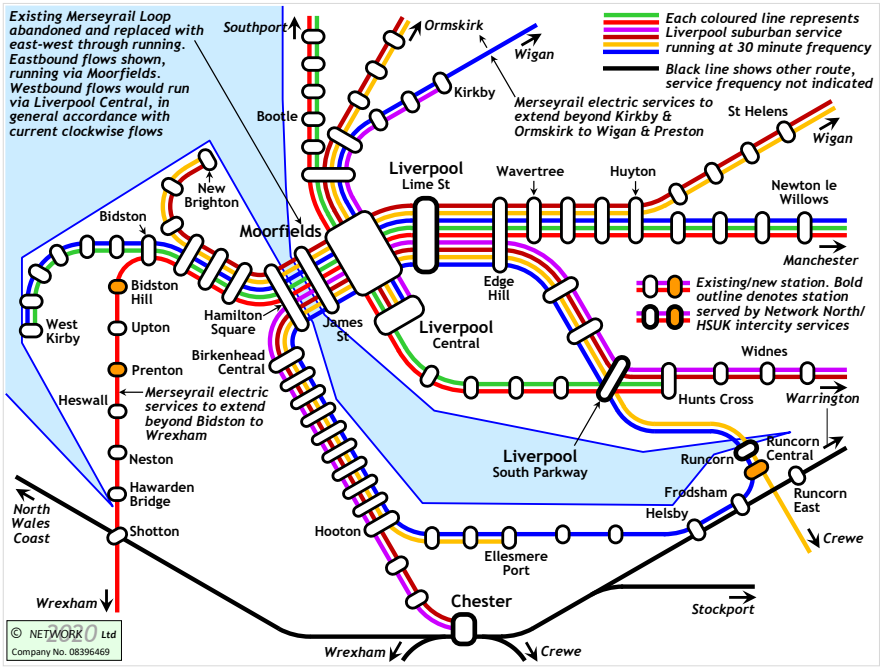
M.03



HSUK Scheme for Improved Local Services in Merseyside

Illustrated services repeated every 30 minutes

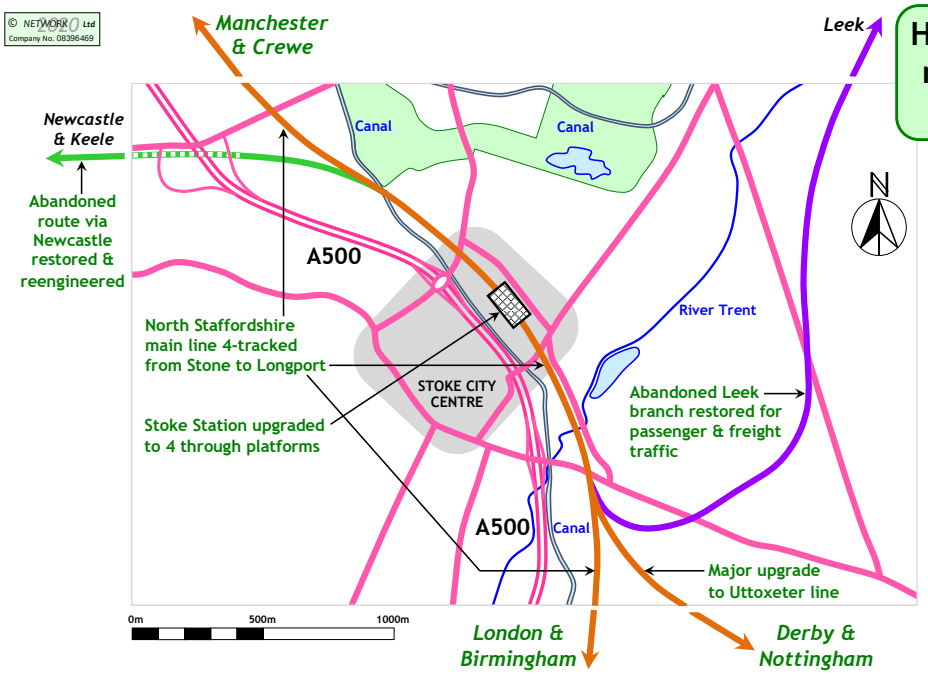
M.04

Stoke/Potteries

HSUK

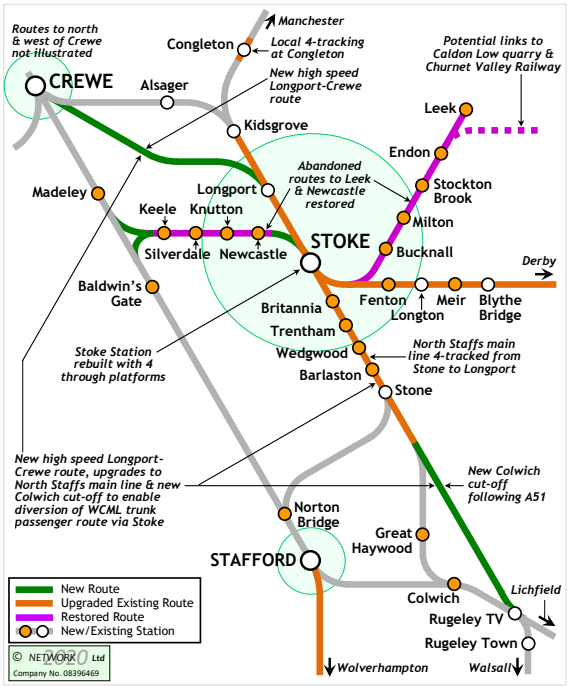
- Network North will serve Stoke at its existing station, upgraded to 4 through platforms.
- This is part of wider strategy to divert WCML passenger route to serve Potteries conurbation and vastly improve Stoke's intercity links.
- North Staffs main line 4-tracked between Stone and Longport for enhanced capacity.
- Together with restoration of key local routes, this will transform local rail network.

N.01



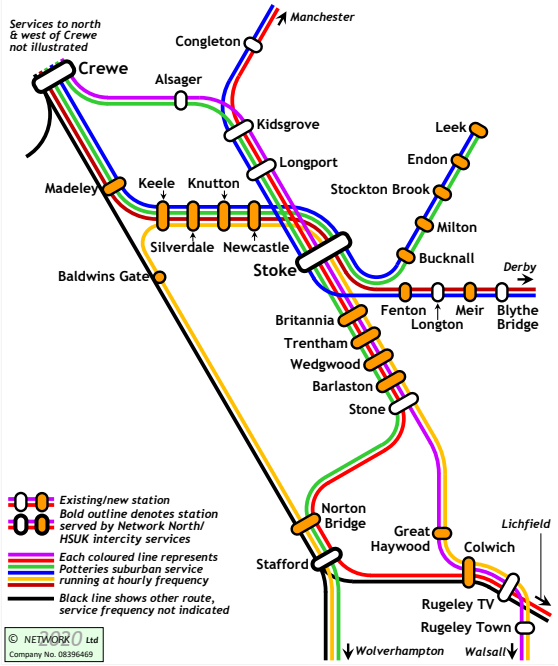
HSUK proposals for new local links at Stoke on Trent

N.02



HSUK Scheme for Improved Rail Infrastructure in Potteries

N.03



HSUK Scheme for Improved Local Services in Potteries

Illustrated services repeated every 60 minutes

N.04

Network Aim 6

HSUK

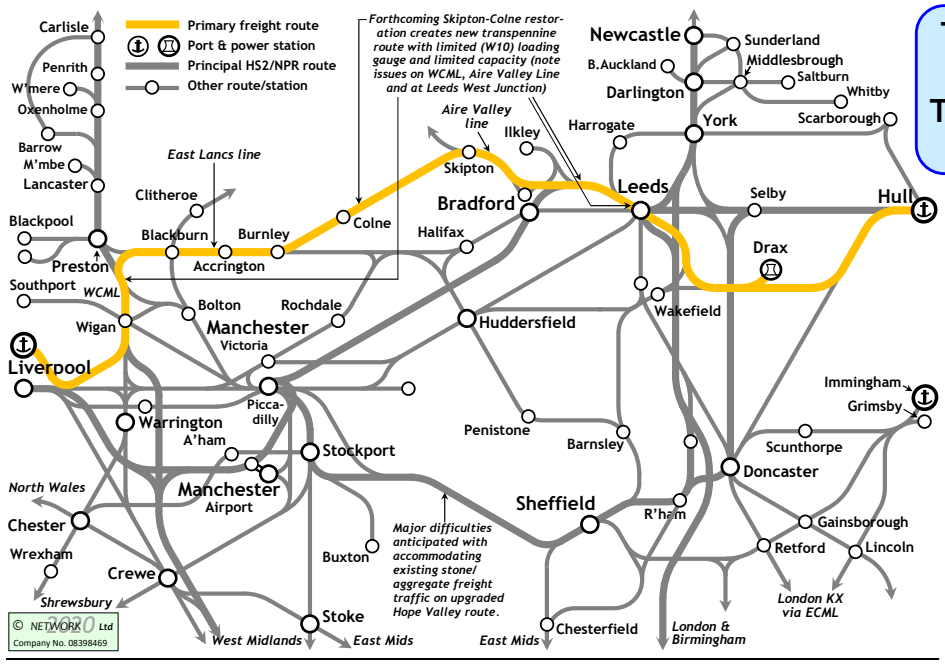
6. Compatibility with TfN ambition for ‘freight super-highway linking Liverpool and the Humber’.

P.01

TfN Freight Scheme

- A proposal to restore the abandoned line between Skipton and Colne represents TfN's only current initiative for a new transpennine freight route.
- This route is compromised by both its capacity (max 1 train per hour) and the limited size of wagon that it can accommodate (only W6 bulk wagons e.g. for biomass to Drax, not W12 marine containers).
- Clearly not the specified 'freight superhighway'!

P.02



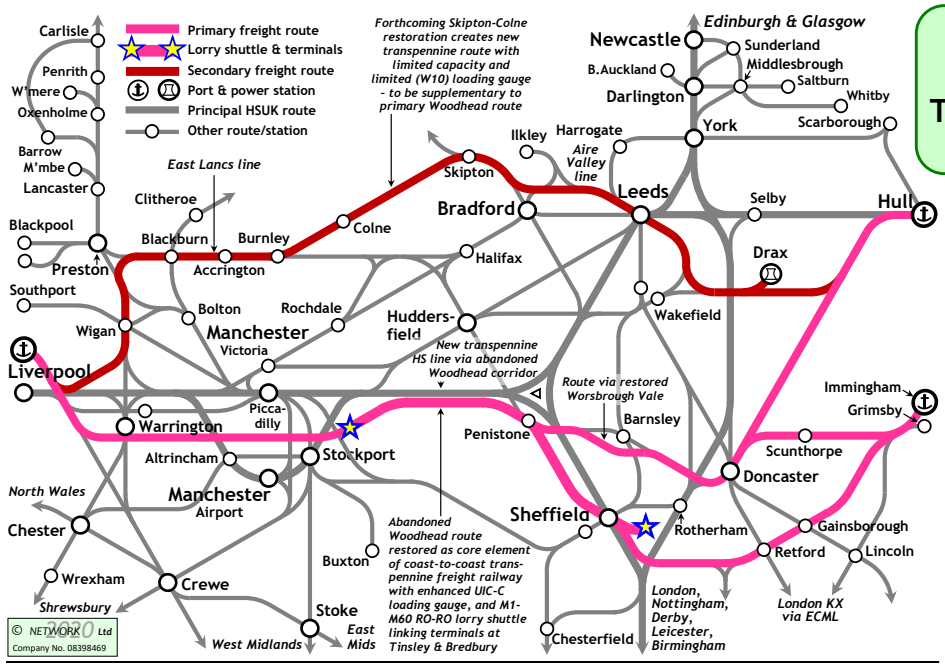
TfN Scheme for Transpennine Freight??

P.03

HSUK Freight Scheme

- HSUK's dedicated Eurogauge (UIC-C) freight route will take high-volume container flows from Port of Liverpool via south Manchester and restored Woodhead route to South Yorkshire.
- This route will extend via upgraded existing lines to Hull and Immingham, thus constituting TfN's specified 'freight superhighway linking Liverpool and the Humber'.
- HSUK's freight scheme also includes a roll-on roll-off lorry shuttle linking M60 in Greater Manchester and M1 in South Yorkshire. This will vastly reduce congestion on trans-pennine roads, particularly the A628T Woodhead Road.

P.04



HSUK Scheme for Transpennine Freight

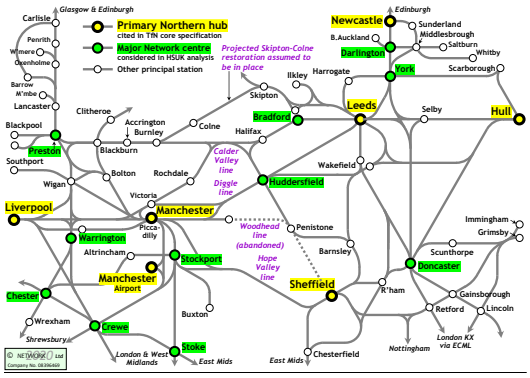
P.05

Network Aim 7

7. Optimised direct links & journey time reductions to principal population centres in other UK regions.

Q.01

National Links??



- 17 cities + 1 airport considered in connectivity analysis of rail network of the Northern Powerhouse
- Links to 34 cities + 4 airports considered in connectivity analysis of wider national rail network
- 38 possible links from 18 centres
- 684 links in total
- Timings for HSUK & HS2 set out on following slides calculated on similar basis to methodology set out in slide G.02

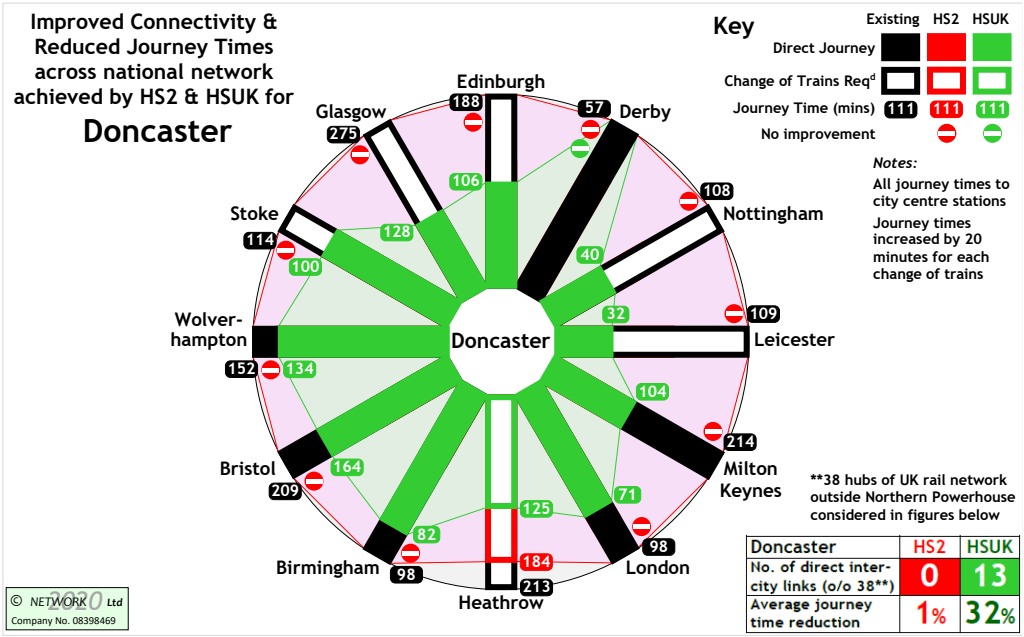
Q.02

Journey Time Reductions Index to City Data

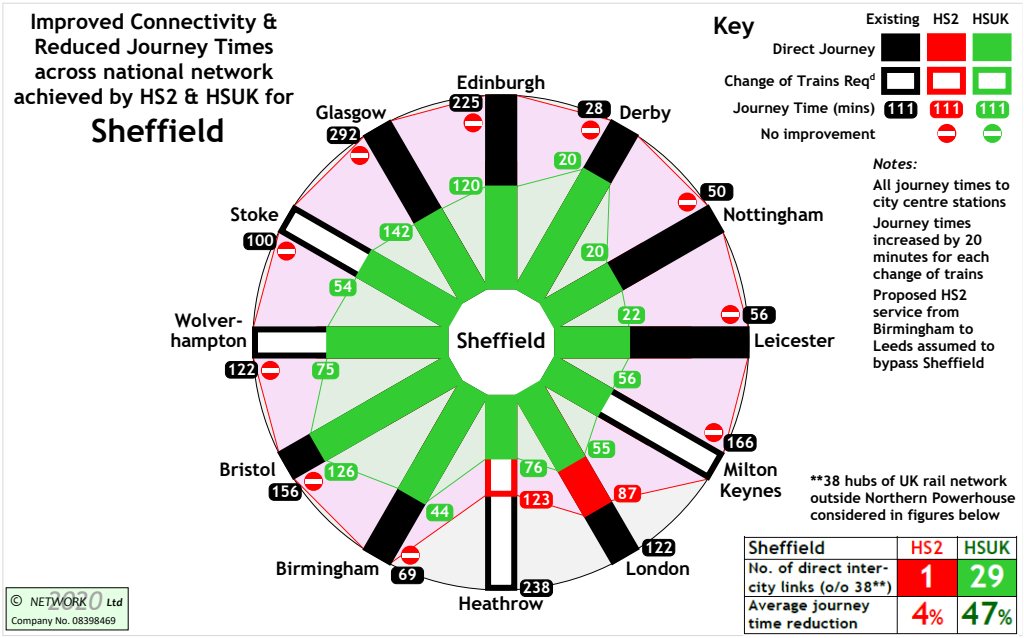
Doncaster	Q.04	Stoke	Q.13
Sheffield	Q.05	Crewe	Q.14
Huddersfield	Q.06	Chester	Q.15
Bradford	Q.07	Stockport	Q.16
Leeds	Q.08	Manchester Airport	n/a
Hull	Q.09	Manchester	Q.18
York	Q.10	Warrington	Q.19
Darlington	Q.11	Preston	Q.20
Newcastle	Q.12	Liverpool	Q.21

Note : HSUK journey time data assumes HSUK north-south trunk route from Glasgow to London, with southern section following M1 corridor

Q.03

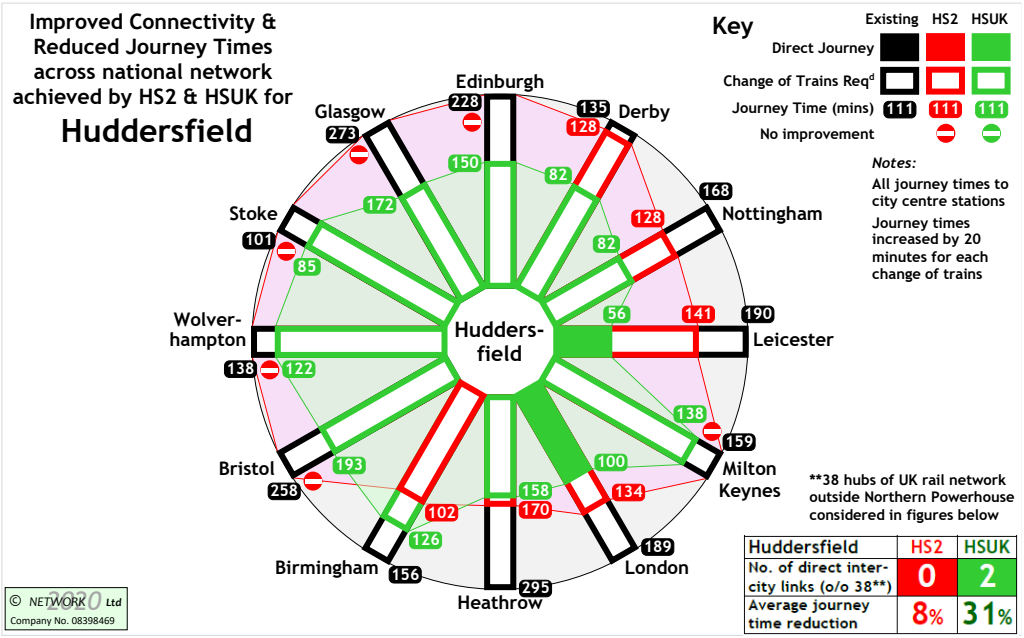


Q.04



Sheffield	HS2	HSUK
No. of direct inter-city links (o/o 38**)	1	29
Average journey time reduction	4%	47%

Q.05

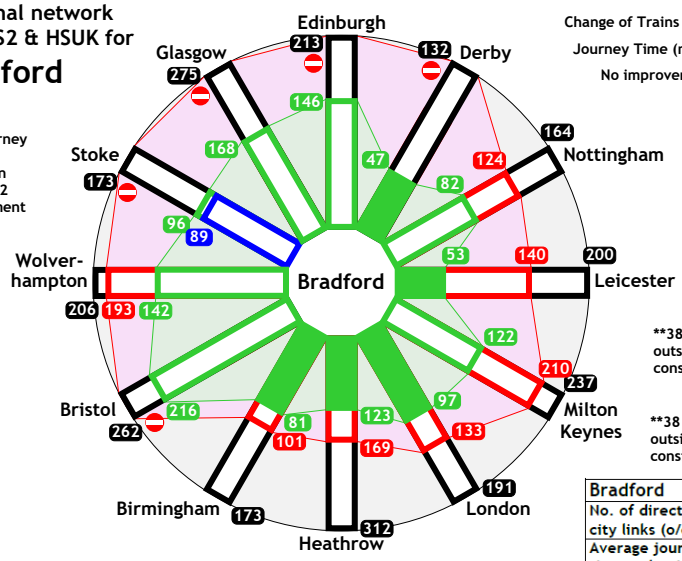


Huddersfield	HS2	HSUK
No. of direct inter-city links (o/o 38**)	0	2
Average journey time reduction	8%	31%

Q.06

Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for Bradford

Note:
Improvements in journey times to Stoke only delivered by Northern Powerhouse Rail. HS2 delivers no improvement



Key

	Existing	HS2	HSUK
Direct Journey			
Change of Trains Req^{d}			
Journey Time (mins)	111	111	111
No improvement			

Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains

**38 hubs of UK rail network outside Northern Powerhouse considered in figures below

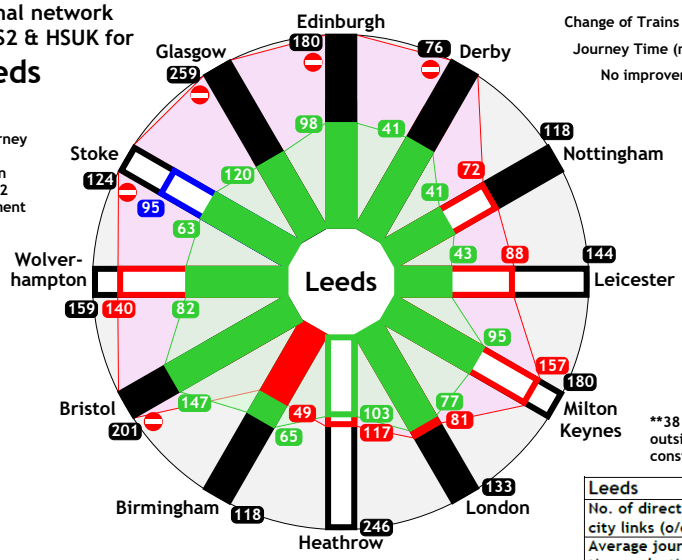
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below

Bradford	HS2	HSUK
No. of direct inter-city links (o/o 38**)	0	10
Average journey time reduction	14%	46%

Q.07

Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for Leeds

Note:
Improvements in journey times to Stoke only delivered by Northern Powerhouse Rail. HS2 delivers no improvement



Key

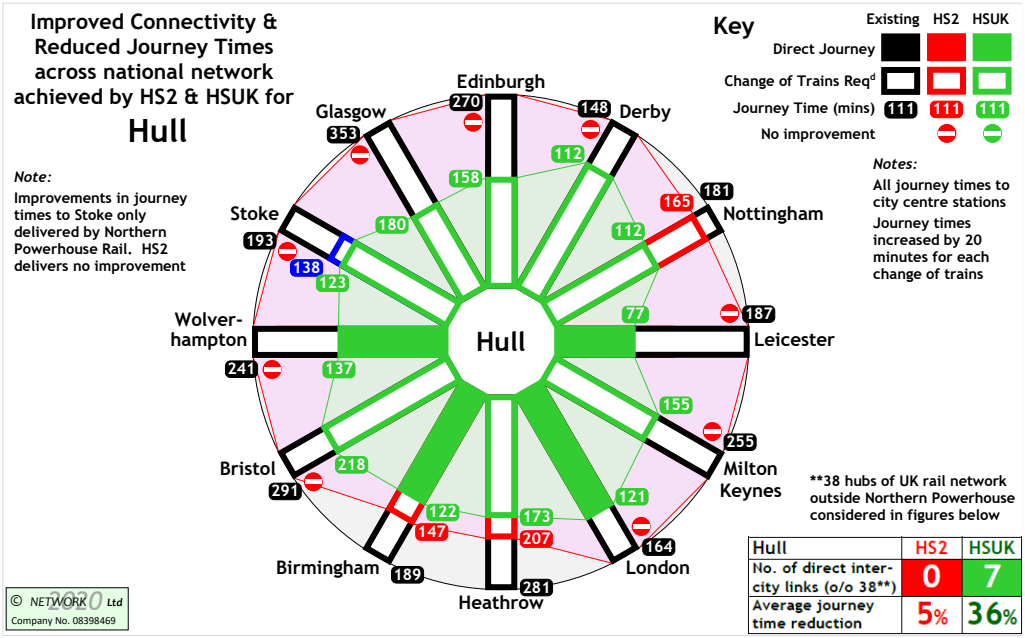
	Existing	HS2	HSUK
Direct Journey			
Change of Trains Req^{d}			
Journey Time (mins)	111	111	111
No improvement			

Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains

**38 hubs of UK rail network outside Northern Powerhouse considered in figures below

Leeds	HS2	HSUK
No. of direct inter-city links (o/o 38**)	3	30
Average journey time reduction	18%	44%

Q.08


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Hull
Note:
Improvements in journey times to Stoke only delivered by Northern Powerhouse Rail. HS2 delivers no improvement
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Stoke
Nottingham
Wolver-hampton
Hull
Leicester
Bristol
Milton Keynes
Birmingham
London
Heathrow
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Hull | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 0 | 7
Average journey time reduction | 5% | 36%
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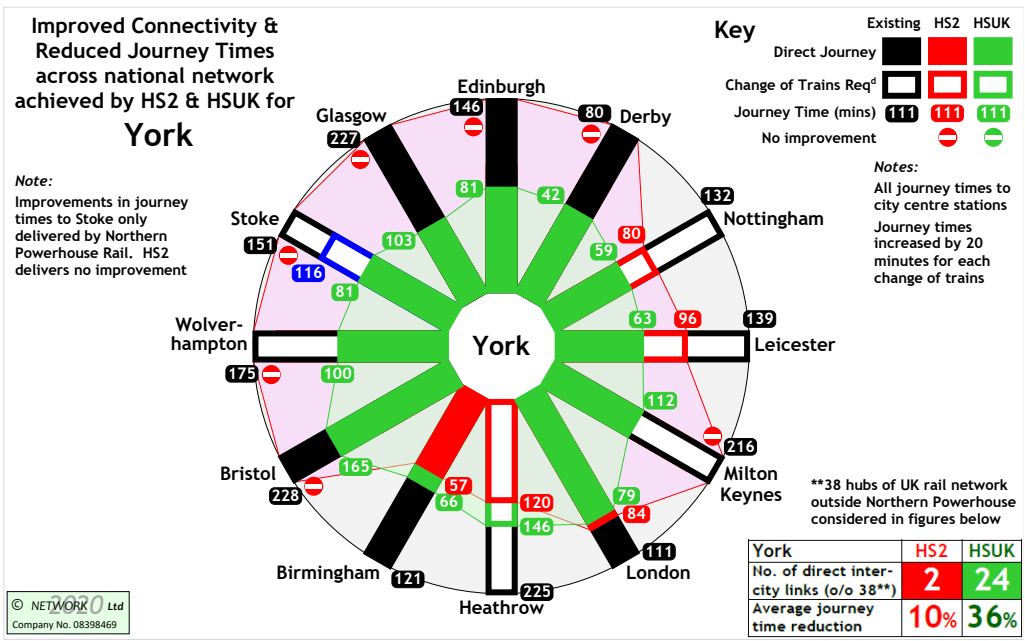
Q.09


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
York
Note:
Improvements in journey times to Stoke only delivered by Northern Powerhouse Rail. HS2 delivers no improvement
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Stoke
Nottingham
Wolver-hampton
York
Leicester
Bristol
Milton Keynes
Birmingham
London
Heathrow
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
York | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 2 | 24
Average journey time reduction | 10% | 36%
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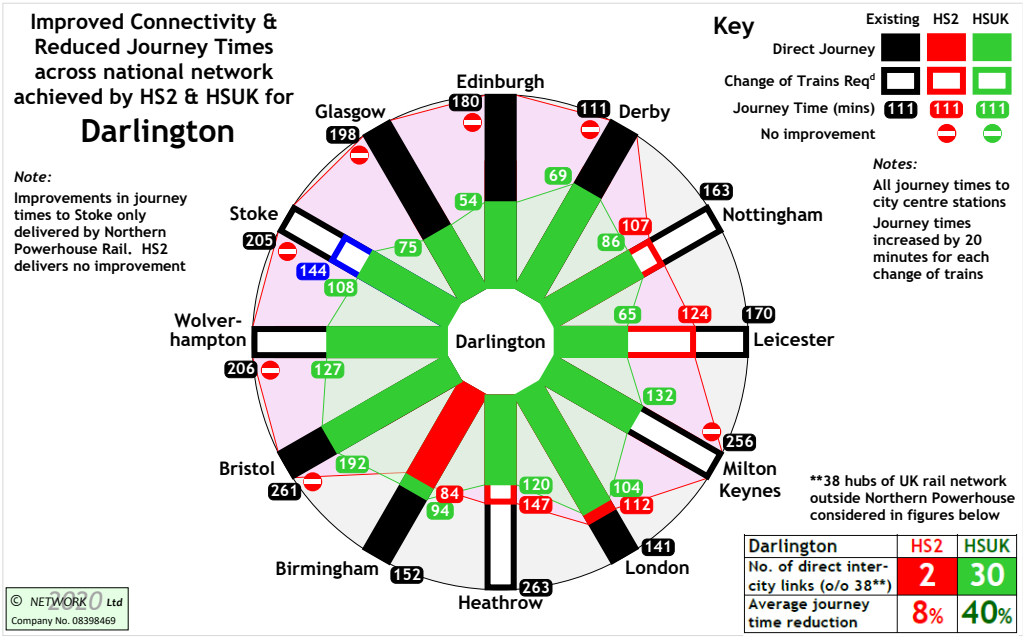
Q.10


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Darlington
Note:
Improvements in journey times to Stoke only delivered by Northern Powerhouse Rail. HS2 delivers no improvement
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Nottingham
Stoke
Wolver-hampton
Leicester
Bristol
Milton Keynes
Birmingham
London
Heathrow
Darlington
180
198
111
163
205
206
170
261
256
152
141
263
54
69
75
107
86
144
108
65
124
127
132
192
84
94
120
147
104
112
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Darlington HS2 HSUK
No. of direct inter-city links (o/o 38**) 2 30
Average journey time reduction 8% 40%
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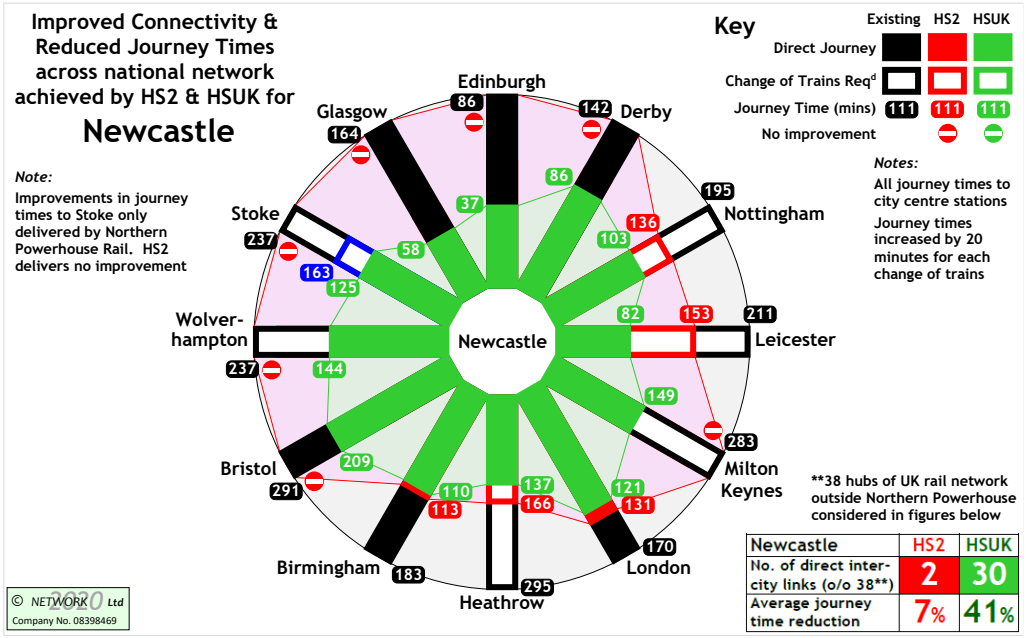
Q.11


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Newcastle
Note:
Improvements in journey times to Stoke only delivered by Northern Powerhouse Rail. HS2 delivers no improvement
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Nottingham
Stoke
Wolver-hampton
Leicester
Bristol
Milton Keynes
Birmingham
London
Heathrow
Newcastle
86
164
142
195
237
237
211
291
283
183
170
295
37
86
58
136
103
163
125
82
153
144
149
209
110
113
137
166
121
131
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Newcastle HS2 HSUK
No. of direct inter-city links (o/o 38**) 2 30
Average journey time reduction 7% 41%
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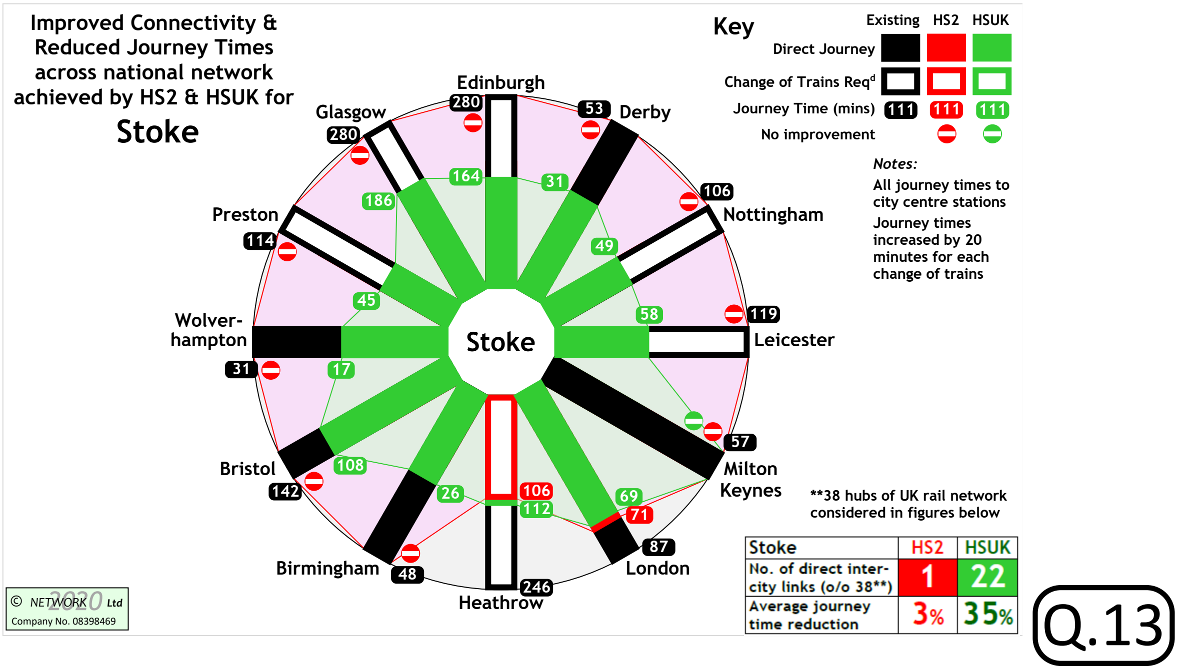
Q.12


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Stoke
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Reqd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh 280 164
Derby 53 31
Nottingham 106 49
Leicester 119 58
Milton Keynes 57
London 87 71 69
Heathrow 246 106 112
Birmingham 48 26
Bristol 142 108
Wolver-hampton 31 17
Preston 114 45
Glasgow 280 186
**38 hubs of UK rail network considered in figures below
Stoke | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 1 | 22
Average journey time reduction | 3% | 35%
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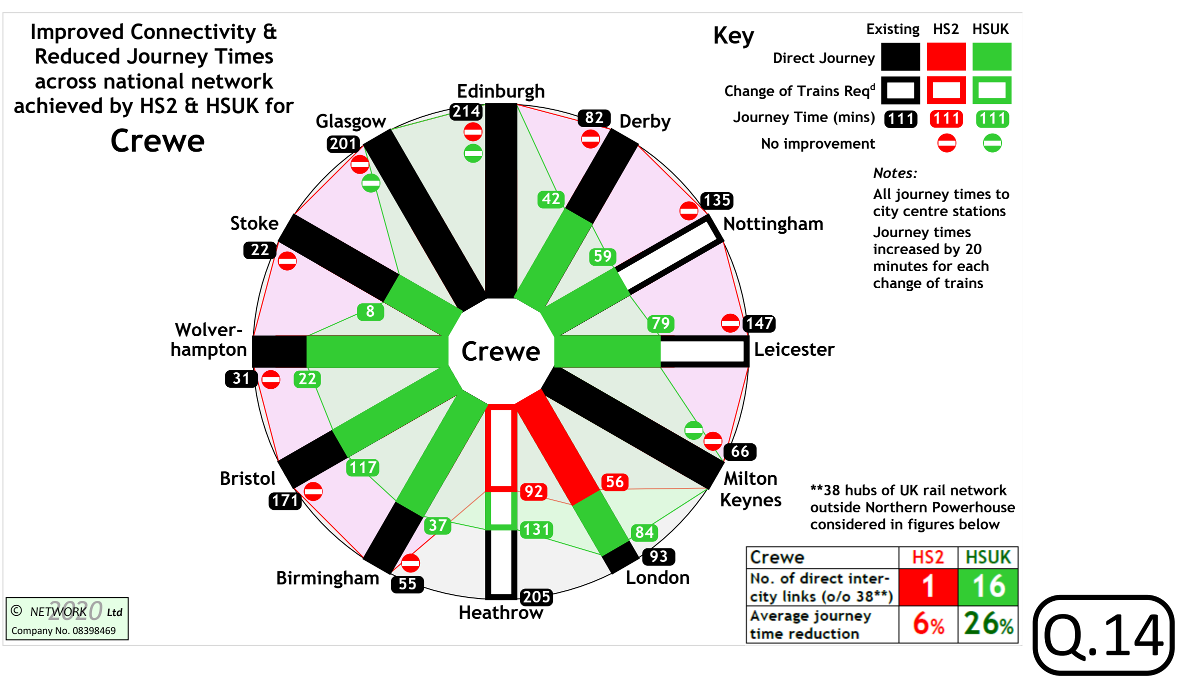
Q.13


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Crewe
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Reqd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh 214
Derby 82 42
Nottingham 135 59
Leicester 147 79
Milton Keynes 66
London 93 56 84
Heathrow 205 92 131
Birmingham 55 37
Bristol 171 117
Wolver-hampton 31 22
Stoke 22 8
Glasgow 201
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Crewe | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 1 | 16
Average journey time reduction | 6% | 26%
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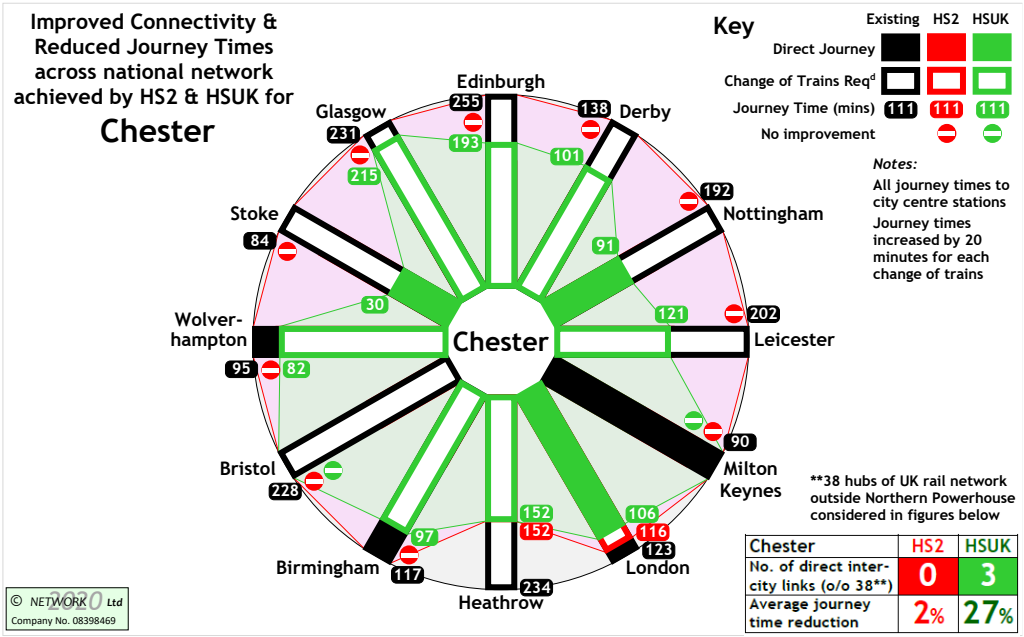
Q.14


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Chester
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Nottingham
Stoke
Wolver-hampton
Leicester
Chester
Milton Keynes
Bristol
Birmingham
London
Heathrow
255
193
138
101
231
215
192
91
84
30
121
202
95
82
90
228
152
152
106
116
97
123
117
234
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Chester | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 0 | 3
Average journey time reduction | 2% | 27%
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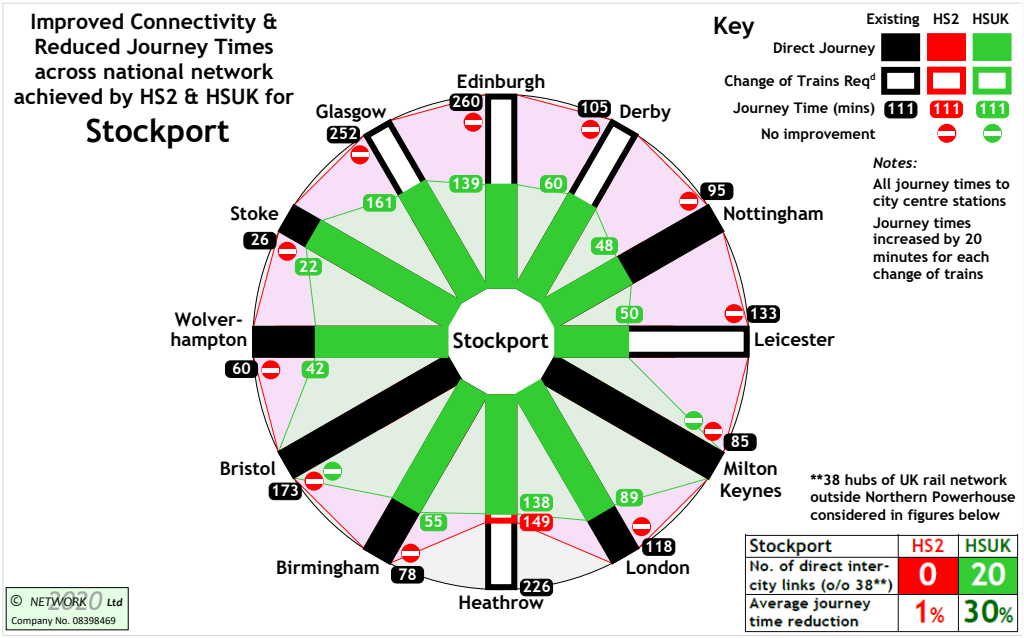
Q.15


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Stockport
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Nottingham
Stoke
Wolver-hampton
Leicester
Stockport
Milton Keynes
Bristol
Birmingham
London
Heathrow
260
139
105
60
252
161
95
48
26
22
133
50
60
42
85
173
138
89
55
149
118
78
226
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Stockport | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 0 | 20
Average journey time reduction | 1% | 30%
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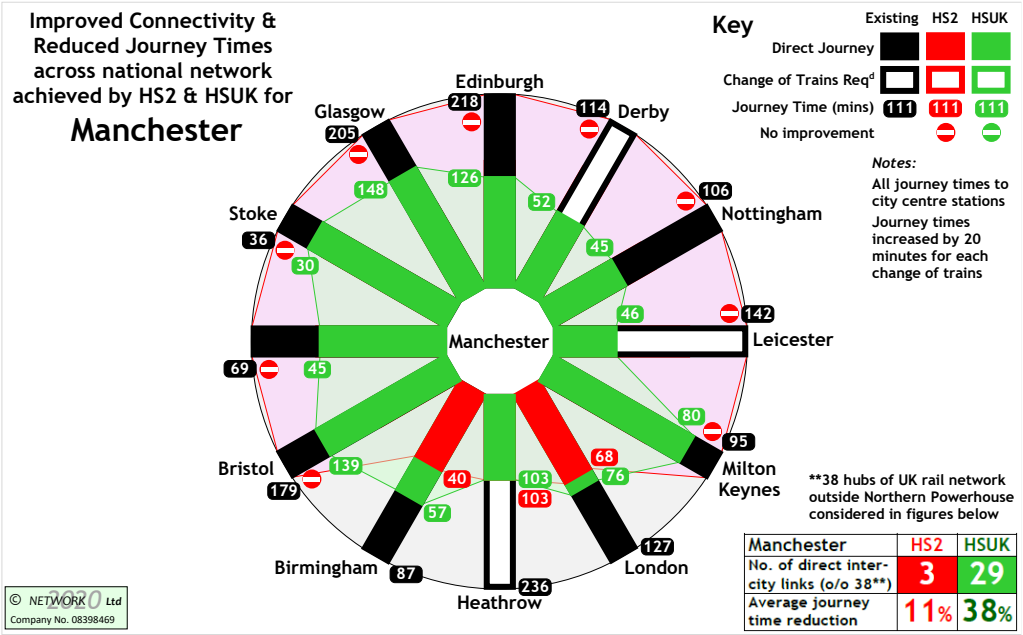
Q.16


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Manchester
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Nottingham
Stoke
Leicester
Manchester
Milton Keynes
Bristol
Birmingham
London
Heathrow
218
205
114
106
36
142
69
95
179
87
127
236
126
148
52
45
30
46
45
80
139
40
57
68
76
103
103
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Manchester | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 3 | 29
Average journey time reduction | 11% | 38%
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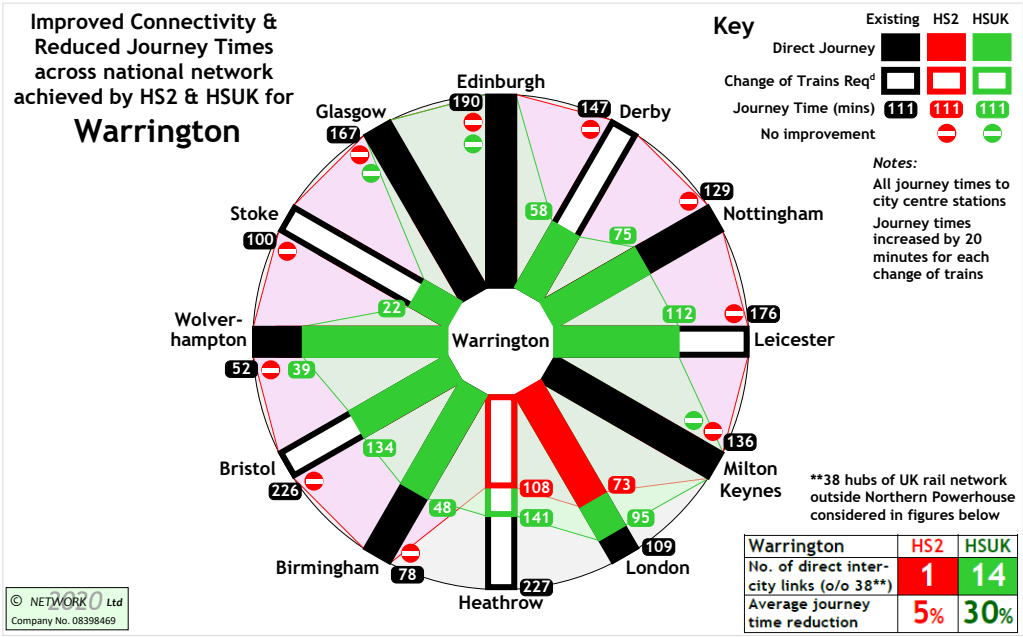
Q.18


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Warrington
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Nottingham
Stoke
Wolver-hampton
Warrington
Leicester
Milton Keynes
Bristol
Birmingham
London
Heathrow
190
167
147
129
100
176
52
39
226
78
136
227
109
58
75
22
112
134
48
108
73
141
95
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Warrington | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 1 | 14
Average journey time reduction | 5% | 30%
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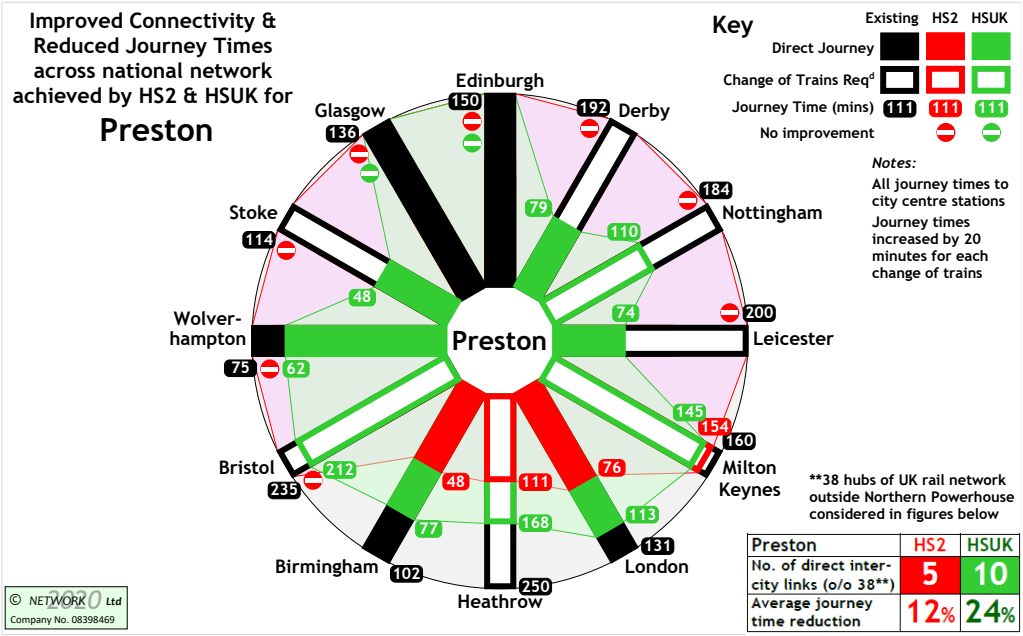
Q.19


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Preston
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Nottingham
Stoke
Wolver-hampton
Leicester
Preston
Bristol
Milton Keynes
Birmingham
London
Heathrow
150
136
192
184
114
79
110
48
74
200
75
62
145
154
160
212
235
48
111
76
77
168
113
102
131
250
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Preston | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 5 | 10
Average journey time reduction | 12% | 24%
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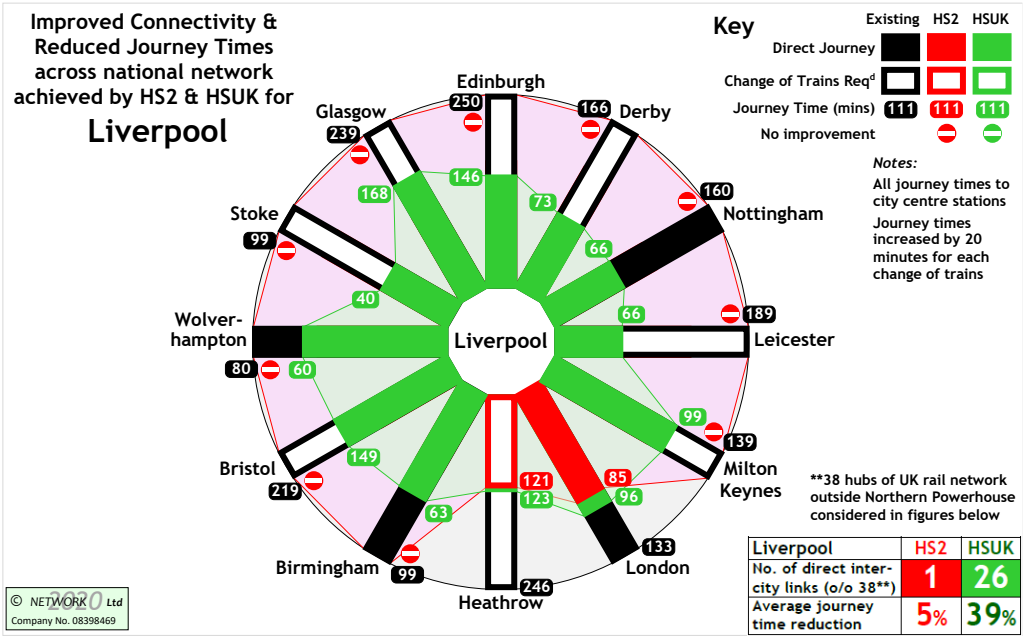
Q.20


Improved Connectivity & Reduced Journey Times across national network achieved by HS2 & HSUK for
Liverpool
Key
Existing HS2 HSUK
Direct Journey
Change of Trains Req'd
Journey Time (mins) 111 111 111
No improvement
Notes:
All journey times to city centre stations
Journey times increased by 20 minutes for each change of trains
Edinburgh
Glasgow
Derby
Nottingham
Stoke
Wolver-hampton
Leicester
Liverpool
Bristol
Milton Keynes
Birmingham
London
Heathrow
250
239
166
160
99
146
168
73
66
40
66
189
80
60
99
139
149
219
121
85
123
96
63
99
133
246
**38 hubs of UK rail network outside Northern Powerhouse considered in figures below
Liverpool | HS2 | HSUK
No. of direct inter-city links (o/o 38**) | 1 | 26
Average journey time reduction | 5% | 39%
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Q.21

Direct Intercity Links without Change of Trains

HSUK

Considering 684 journeys linking 18 key Northern Powerhouse centres to 38 other centres of UK railway network:

- HS2 offers 22 direct links – 3% efficiency
- HSUK offers 334 direct links – 49% eff^{cy}

Q.22

Overall Journey Time Reduction Performance

HSUK

Averaged across 684 journeys linking 18 key Northern Powerhouse centres to 38 other centres of UK railway network:

- HS2 achieves 8% average JT reduction
- HSUK achieves 36% average JT red^{n}

Q.23

Final Scorecard

HSUK

	Criterion	Metric	HSUK	NPR
1a	Compliance with TfN specification?	out of 21	19	12
1b	Non-compliance with TfN specification?	out of 21	2	9
2	Direct links between key centres?	out of 153	136	64
3	Step-change journey time reductions?	%	43%	20%
4	Full integration with local services?	Y/N	Y	?
5	Step-change local capacity increase?	Y/N	Y	N
6	Compatibility with TfN freight vision?	Y/N	Y	N
7a	Direct links to other UK cities?	out of 684	334	22
7b	National journey time reductions?	%	36%	8%

HS2

HSUK wins on every criterion

R.01

Simple Conclusion

HSUK

- Network North outperforms the official Northern Powerhouse Rail proposals by a factor of at least 2 on all criteria.
- This should not happen on a properly-remitted and well-regulated public infrastructure project.
- It is legitimate to inquire how this has happened.

R.02

Rationale for NPR Fail

HSUK

- Success of HSUK against all 7 network criteria shows that the TfN core specification is both achievable and also the logical first step in developing an efficient railway network for the North.
- Failure of TfN's Northern Powerhouse Rail even to meet TfN's own core specification can be attributed to the false imperative for NPR to conform with the established HS2 scheme.
- This appears to have taken precedence over TfN's true priority – to develop for the people of the North the best possible railway network that will improve links between Northern communities and thus deliver the greatest prosperity.

R.03

A Challenge to TfN

HSUK

- This study has demonstrated that on the available evidence, the official Northern Powerhouse Rail proposals will fail to meet TfN's own core specification for journey times and service frequencies, and will fail to meet the needs of the people of the North for an efficient and optimised railway network.
- These assertions are justified by the vastly superior performance of the High Speed UK Exemplar Alternative.
- TfN must either:
  - refute these allegations; or…
  - provide further info to justify their own proposals; or…
  - abandon NPR and support the HSUK alternative.

R.04

Integrated Rail Plan - 1

- In February 2020 the Oakervee Review of the HS2 project recommended the development of an 'Integrated Rail Plan for the whole GB network'.
- This was intended to address HS2's self-evident lack of integration, and ensure that HS2, Northern Powerhouse Rail, Midlands Rail Hub and other major Network Rail upgrades would together deliver an efficient national rail network.
- The Government adopted Oakervee's recommendation, and is now developing the Integrated Rail Plan.

S.01

Integrated Rail Plan - 2

- So far, no criteria have been developed either to:
  - define the Integrated Rail Plan's technical objectives.
  - stipulate how the national railway system resulting from the 'Integrated Rail Plan for the whole GB network' should perform.
- Yet the Integrated Rail Plan can only have one basic aim – to develop for the people of the UK the best possible railway network, offering the greatest possible enhancement in connectivity and capacity, and thereby maximising both economic benefits and CO_2 reductions.

S.02

Integrated Rail Plan - 3

- It is vital for the interests, of both the UK regions and of the entire UK, that the Integrated Rail Plan delivers the best possible regional and national railway network.
- The 'Key Network Objectives' set out in Slide C.11 are precisely aligned with this fundamental aim, and effectively establish the requirements of the Integrated Rail Plan.
- HS2 & NPR comprehensively fail to meet these objectives.
- By contrast HSUK's success means that HSUK alone meets the fundamental aim of the Integrated Rail Plan.

S.03

Final thoughts…

Northern Powerhouse Rail and HS2 :

- NPR network hugely compromised by predication upon HS2; therefore…
- Hugely reduced economic benefit;
- No worthwhile regional rebalancing;
- Minimal CO_2 reductions;
- Little post-pandemic recovery;
- No justification whatsoever for HS2.

S.04

APPENDIX D

HSUK input to Union Connectivity Review dated August 2021

The recently published (March 2021) preliminary report of the Union Connectivity Review should set out a strategy by which the primary cities of Scotland, Wales and Northern Ireland (i.e. Edinburgh, Glasgow, Cardiff and Belfast) could be tied into a transformed national network, and thus remedy the historic disconnect between the UK nations.

However, the report sets out no such strategy, still less does it establish any core specification to define how the overall UK network should perform, or display any understanding of how this network might be optimised. Instead it merely sets out a predictable list of minor incremental schemes that will do virtually nothing to promote the unity of the United Kingdom or counter the drift toward separatism.

HSUK's input to the Union Connectivity Review:

- Establishes ideals for cross-border, and general inter-regional connectivity on the island of Great Britain i.e. all principal cities interlinked with direct and frequent services of 'intercity' quality. (See Section 2).
- Assesses likely performance of official schemes (i.e. HS2, Northern Powerhouse Rail and Midlands Rail Hub) and High Speed UK against these ideals. (See Sections 4 and 7).
- Reviews connectivity and practicality of potential Fixed Link to Northern Ireland. (See Section 9).
- Sets out an alternative air/rail solution based upon air routes from Northern Ireland to principal GB airports, and onward direct rail links via HSUK to most major English, Scottish and Welsh cities. (See Sections 9 and 10).

HSUK Response to Public Consultation re Union Connectivity Review

All HSUK responses in black : All DfT prompts in red

Assessing the need for cross-border connectivity

1. If you represent a place, what is your current strategy for growing the economy and improving the quality of life there?

Please provide a summary, but you are welcome to append or link to published strategies.

High Speed UK (HSUK) does not represent the interests of any specific place or region, but rather the entire United Kingdom in its need for a railway network which provides optimum connectivity between the major population centres in all the nations of 'mainland' Great Britain.

'Optimum connectivity' is defined as the provision of direct (i.e. no change of trains) high-quality intercity services operating at hourly or better frequency on all routes connecting the major population centres. This enhanced intercity network must be fully integrated with enhanced local networks to deliver optimum overall connectivity.

Currently, connectivity between all UK regions/nations is poor, when compared with the much higher quality of regional links to London (see Figure 1.1 on the following page). This poor connectivity is a key factor in the North-South divide that has long afflicted the entire UK economy, and a transformational improvement is vital to satisfy Government pledges for:

- Economic growth from improved transport connectivity;
- Regional rebalancing from greater connectivity between regions;
- CO_2 reductions from step-change road to rail modal shift;
- 'Building back better' after the Covid-19 pandemic.

In the context of the cross-border connectivity that is the subject of this Consultation, there is the additional dimension of the growing political movements for independence, whether in Scotland, Wales or Northern Ireland. This response does not in any way question the legitimacy of these 'nationalist' movements – but it deplores the historic neglect of cross-border connectivity by successive UK Governments, which has clearly and needlessly contributed to the desire for separatism.

a) What is necessary to achieve this strategy and what evidence do you have that improved connectivity is needed in this instance?

We expect that transport is not the only factor necessary to achieve regional strategies and would like to understand what else might need to be in place to see benefits from improvements in connectivity.

To achieve the HSUK strategy of comprehensive connectivity (as set out in Section 7, Figures 7.1 & 7.2) between major cities/conurbations, two crucial changes are necessary:

- A holistic, network-led approach to development and optimisation of the national rail network (i.e. on the island of Great Britain);
- Recognition by Government – and indeed, the entire transport establishment - that this holistic, network-led approach has been absent in all current strategies for railway development, including HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH).

The deficiencies of the existing railway system are set out in Figure 1.1. This charts the direct links that the existing system offers between 18 principal cities which represent the major conurbations of the UK; it also ranks each link by the quality of the train and by the frequency, with all sub-hourly services specifically identified.

Each city is scored by the number of direct links, and by the quality of service that it enjoys. The 3 principal cities of Scotland and Wales – Edinburgh, Glasgow and Cardiff – and the 'cross-border' links from these cities to English cities are identified in purple; Scottish flows are identified in dark blue, Welsh flows in red.

A Scottish 'perfect score', with direct hourly intercity services on all 32 possible cross-border links, would be 192.

A Welsh 'perfect score', with 17 possible cross-border links, would be 102.

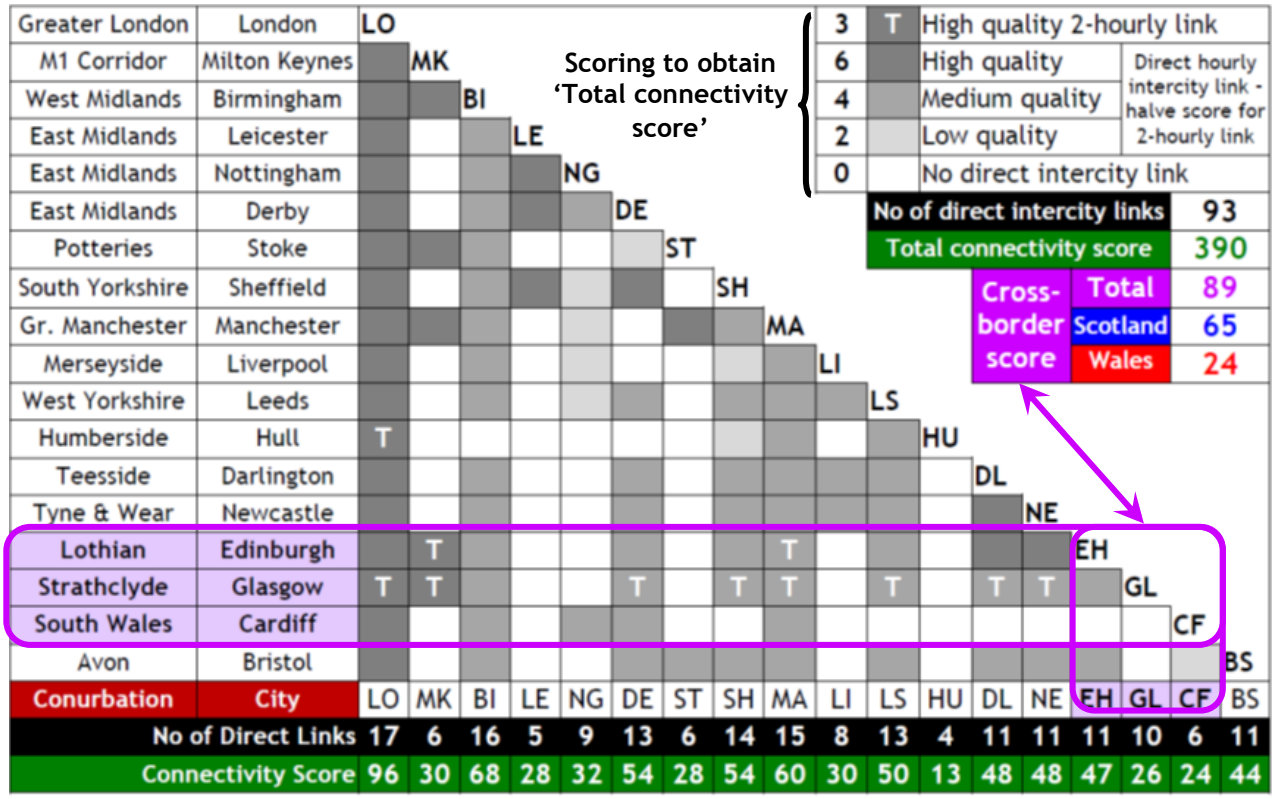


Figure 1.1 : Connectivity Performance of Existing Intercity Railway Network

Figure 1.1 shows a highly sub-optimal national railway network that falls far short of the ideal of comprehensive interconnectivity. London is the only city to enjoy direct intercity links to all regional cities, and these links generally employ the highest quality rolling stock. By contrast, there are no direct links between many regional cities, and where direct links do exist, the rolling stock is generally of much poorer quality.

The quality of 'cross-border' links, especially to Glasgow and Cardiff, can generally be categorised as 'poor', with a 'cross-border score' of 89 out of 282 – i.e. 32% network efficiency.

However, these cross-border links must be viewed in the context of intercity links to certain English cities/regions – in particular Leicester, Nottingham and Hull – which are of similar poor quality.

If the UK is to derive the economic and environmental benefits from a fully-connected national rail network, in line with the Government policy aims set out in Item 1, then it is self-evident that a network-wide approach must be taken to obtain gains that are both maximised and spread evenly across the nation:

- Cross-border links must be improved to ensure that Welsh and Scottish cities are provided with efficient and high-quality direct connections to all major English cities, not just to London.
- Exactly the same consideration must also be applied to routes between all poorly-connected English cities.
- Local networks must be improved in all UK nations, with improved interchange at hub stations in all major cities, to ensure that all communities benefit from the improved cross-border intercity links.

2. Please provide any information you hold about current multi-nation journeys within the United Kingdom.

In your answer, please provide information relating to:

- *current journey volumes or levels*
- *assessments of future demand*
- *journey reliability*
- *locations or corridors of particular strategic importance*
- *the reasons for importance*

The asymmetric and highly London-centric national railway network illustrated in Figure 1.1 is both a symptom and a cause of the north-south divide that has long afflicted the UK economy. The lack of links between regional cities reflects the low level of economic activity in the regions, relative to London; and without these links, the disconnected regional economies will lack the necessary stimulus to develop.

This 'chicken and egg' situation means that existing flows – for instance between Liverpool and Glasgow, a 'city pair' without any direct interlinking rail service – do not in any way indicate the potential flows that could exist. In a rebalanced economy, in which all principal regional cities would be linked with direct high speed services, much greater flows could be anticipated between Liverpool and Glasgow.

Such flows would be broadly 'gravitational', proportional to the populations connected and inversely proportional to the distance between them, as indicated in Figure 2.1.

$$\text{Intercity Flow } Q_{12} = k \times \frac{P_1 \times P_2}{D_{12}}$$

NB k = proportionality constant

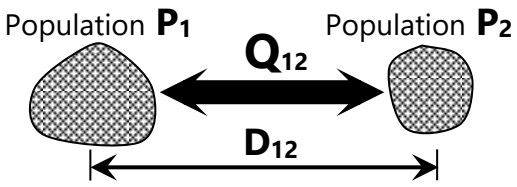


Figure 2.1 : Idealised Modelling of Intercity Flows

It is not appropriate to identify specific routes or corridors that might have lesser or greater importance. Two crucial points must be recognised:

- All interregional/cross-border links between primary cities/major conurbations should be considered as having equal importance in the development of a network that will enable a rebalanced economy.
- Even with the greater intercity flows that might apply in a rebalanced economy, the flows that would exist between individual cities would probably be insufficient to support frequent intercity services. Instead, the network must be developed in such a way as to combine multiple intercity flows onto a single train.

The first point is effectively a restating of the conventional argument for holistic design, that the 'whole' should always be greater than the 'sum of the parts'.

The latter point can be best illustrated by the exemplar of a potential high speed link between Liverpool and Glasgow. See Figure 2.2 below.

Liverpool – Glasgow via West Coast –
one service linking just 2 major cities

	LI	MA	LS	DL	NE	EH	GL
Liverpool	LI			■			Direct i/c link
Manchester		MA					
Leeds			LS				
Darlington				DL			
Newcastle					NE		
Edinburgh						EH	
Glasgow	■						GL

Liverpool – Glasgow via East Coast –
one service linking 7 major cities

	LI	MA	LS	DL	NE	EH	GL
Liverpool	LI			■			Direct i/c link
Manchester	■	MA					
Leeds	■	■	LS				
Darlington	■	■	■	DL			
Newcastle	■	■	■	■	NE		
Edinburgh	■	■	■	■	■	EH	
Glasgow	■	■	■	■	■	■	GL

Figure 2.2 : Options for Liverpool-Glasgow Link via West and East Coast routes

The most direct route would be along the 'West Coast' corridor, following the route of the existing West Coast Main Line; yet such a route would only link Liverpool and Glasgow, with intermediate calling points at Preston and Carlisle contributing relatively

small flows additional to the Liverpool-Glasgow flow. Such a route would seem unlikely to be economically viable; certainly, such a service has never previously successfully operated at any worthwhile frequency.

However, Liverpool and Glasgow cannot be considered in isolation. 3 similar enhanced routes – Liverpool/Edinburgh, Manchester/Glasgow and Manchester/Edinburgh - would also need to exist to comprehensively link the primary cities of the North-West of England and Scotland, yet these services would be scarcely any more viable than a Liverpool-Glasgow service. Not only would they be uneconomic to operate, four such services all running at hourly frequency would also impose impossible capacity pressures on the existing West Coast Main Line.

This might help build the case for a new high speed line through the mountainous and environmentally sensitive terrain on the Lake District fringes. Yet this also appears an impracticable option; certainly, neither HS2 Ltd nor the Government have advanced any credible proposals for such a route that would be either economically viable or environmentally acceptable. These issues are discussed in greater detail in Section 4.

This leaves the outwardly unlikely option of an East Coast route as the only remaining option. This might appear circuitous, but it has the crucial advantage of connecting a far greater number of major communities. As shown in Figure 2.2, such a route would connect 7 major conurbations i.e. Merseyside/Liverpool, Greater Manchester, West Yorkshire/Leeds, Teesside/Darlington, Tyneside/Newcastle, Lothian/Edinburgh and Strathclyde/Glasgow.

These 7 linked conurbations give rise to 21 separate flows (most probably greater than the Liverpool-Glasgow flow) which would both efficiently fill frequent services, and also help build the economic case for building an east-sided high speed line to Scotland, in much more favourable terrain than for a similar west-sided route. Detailed route design undertaken by HSUK also indicates that a Liverpool-Glasgow service running along a transpennine high speed line and an east-sided cross-border high speed line would offer shorter journey times than via the existing West Coast Main Line.

3. In general terms, is there a need for new or improved transport links between the nations of the United Kingdom?

If so, please:

- *explain why and provide evidence to support your view*
- *ensure that your response relates specifically to multi-nation transport links and not to improvements in connectivity in general*

As demonstrated in the previous paragraphs, there is a clear need for new or improved transport links between the nations of the United Kingdom. However, this can only be viewed as part of a much wider priority to establish improved and symmetrical connectivity between all UK regions.

4. What are the main obstacles and challenges in improving transport connectivity between the nations of the UK?

Please provide evidence relating to any specific challenges that prevent or hinder the development of additional or improved transport links. Please consider socio-economic, political, organisational and practical issues.

The main impediment to improving transport connectivity between UK nations is the historic incompetence in Government strategy for railway development. The problem lies not with the politicians who direct policy genuinely aimed at a better railway system, but with the civil servants, advisors and consultants who are charged with turning this policy into a workable strategy.

These advisors, supposedly experts in rail transport, have consistently failed to understand the crucial importance of 'network'. They have failed to ensure that all key strategic interventions such as HS2, Northern Powerhouse Rail, Midlands Rail Hub etc should together contribute to the development of an enhanced and better-connected national railway network that is actually capable of delivering the public policy goals of:

- Economic growth from improved transport connectivity;
- Regional rebalancing from greater connectivity between regions;
- CO_2 reductions from step-change road to rail modal shift;
- 'Building back better' after the Covid-19 pandemic.

No Specification for National Network to deliver Public Policy Goals

This failure can be seen most clearly in the development of HS2. This was primarily specified as a new high speed line from London to the West Midlands, but with no specification for how the overall national rail network would perform with HS2 in place. This resulted in the scheme for the HS2 'Y-network', with further new routes extending northwards from the West Midlands to the North-West and to Yorkshire, with services planned to continue on the existing WCML to Scotland, and on the existing ECML to the North-East. See Figure 4.1.

Subsequent 'Infill' Projects in Northern Powerhouse & Midlands Engine

This in turn led – when it was realised that the 'Y-network' failed to offer any transpennine connection – to the subsequent Northern Powerhouse Rail initiative to interconnect Northern cities. A similar logic has led to the development of the Midlands Rail Hub scheme. See also Figure 4.1.

Development of Integrated Rail Plan

The Government is now committed to the development of an 'Integrated Rail Plan for the Whole GB Network'. This plan is intended to draw together the disparate elements of the HS2 'Y-network', Northern Powerhouse Rail and Midlands Rail Hub and other more localised interventions into a coherent programme for the development of the national rail network. This philosophy appears now to be embodied in the Government's new 'Great British Railways' initiative with its ambition for 'one connected network'.

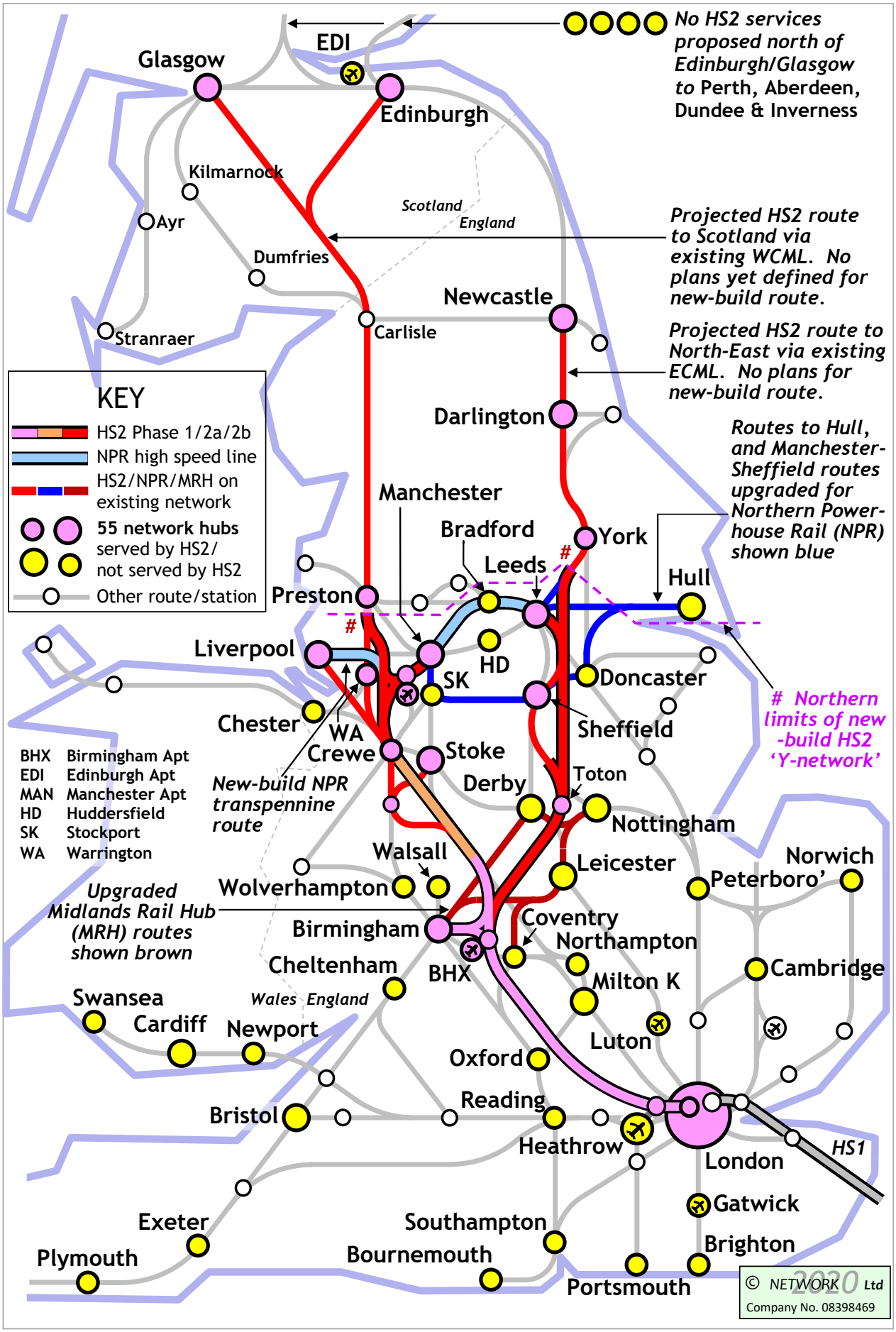


Figure 4.1 : National Network with HS2, NPR and MRH in place

However, as with its constituent schemes, no defining technical standards have been established for how the enhanced national railway system resulting from the Integrated Rail Plan will perform. It seems simply to have been assumed that optimised network performance will come about through the combination of HS2, NPR and MRH – none of which were ever designed with any meaningful consideration of national network.

The results of this haphazard and disjointed 'strategy' are set out in Figure 4.2. This superimposes the connectivity offered by HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH) onto the connectivity offered by the existing network (as set out in Figure 1.1). Again, the cross-border connectivity between English, Scottish and Welsh cities is specifically identified.

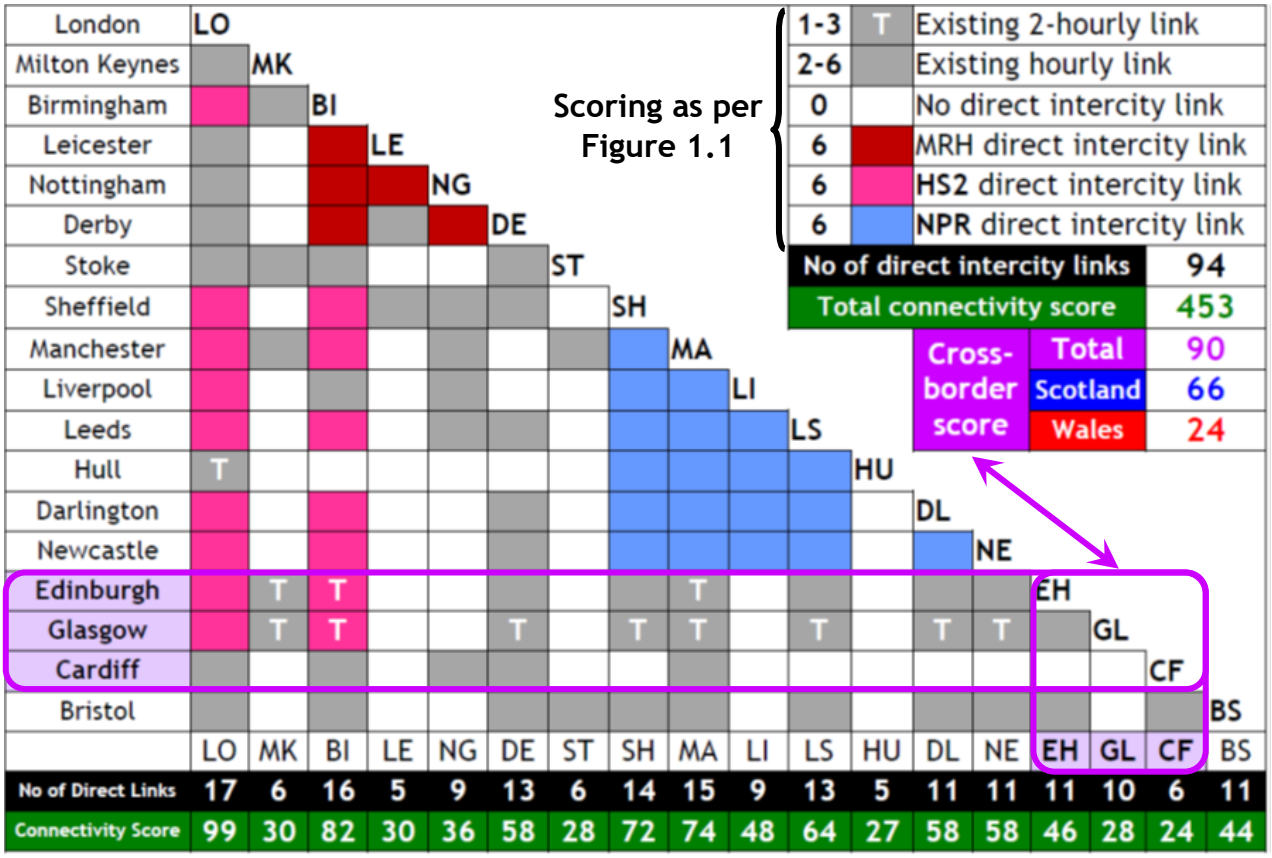


Figure 4.2 : National Network Performance with HS2, NPR and MRH in place

Figure 4.2 demonstrates the following:

- Even with HS2, NPR and MRH in place, fundamental network performance remains largely unaltered. HS2 offers no new intercity links, and it directly benefits only 16 journeys (out of 153), all to either London or Birmingham.
- This reflects not only the basic configuration of a 'Y-network' focussed upon England's first and second cities, but also a 'cherry-picking' approach by which HS2 has been designed to exploit only the most lucrative, highest volume flows, primarily from London and Birmingham to Manchester and Leeds.
- Overall, HS2, NPR and MRH only improve 40 (out of 153) journeys, 54 journeys remain reliant on the existing network, and 59 city pairs lack any intercity connection.
- HS2 and its associated schemes offer no meaningful improvement in cross-border journeys to Wales.
    - HS2 services to the proposed Birmingham Curzon Street terminus cannot interchange with existing intercity services to Wales via Birmingham New Street.

    - Even if Midlands Rail Hub proposals for improved services to South Wales are implemented, a short walking connection between HS2's Curzon St terminus and the existing Moor St terminus will still be required.
    - There appears to be no prospect of direct high speed services from Northern and Scottish cities to Cardiff and South Wales (or indeed to Bristol and the West Country).
- HS2 also offers meagre improvement in cross-border journeys to Scotland:
    - These improvements will be confined to west-sided routes from Edinburgh and Glasgow, only to London and Birmingham.
    - All other journeys from Edinburgh and Glasgow to other English regional cities will remain reliant on the existing network.
    - With no proposals for new high speed line construction north of Wigan, and with potentially critical capacity pressures on the existing WCML, journey time reductions and new service opportunities will inevitably be limited.

WCML Capacity Pressures and Potential New HS2 Route to Scotland??

It is important to recognise the capacity pressures on the existing West Coast Main Line, and the engineering problems that have rendered unviable the construction of a new high speed line along this corridor.

For the vast majority of the WCML's length, from the northern end of the HS2 new-build route near Wigan to Glasgow and Edinburgh, the route comprises just 2 tracks. It is one of 2 key intercity routes linking English cities to the principal cities of Scotland, it is a vital link to the local communities along its route, and it also comprises the primary railfreight route between England and Scotland. These 3 types of rail traffic - variously express passenger, local passenger and freight - must compete for space on these 2 tracks; and with all traffic types having differing speed and stopping patterns, capacity is limited to no more than 5-6 trains per hour.

The introduction of additional HS2 services to the WCML can only exacerbate already-critical capacity pressures, but as yet, no schemes have been advanced to deliver the necessary step-change capacity increase. In the absence of such a scheme, there are 3 likely consequences:

- services to intermediate communities e.g. Lancaster, Kendal/Oxenholme, Penrith, Carlisle and Lockerbie will be reduced to make way for higher-speed, non-stop HS2 services;
- HS2 journey times will be compromised by both the limited (sub-200km/h) speed capability of the existing WCML, and by the inability of non-tilt HS2 'classic compatible' rolling stock to operate even at the speed attained by the existing tilting 'Pendolino' trains;
- insufficient capacity will exist to operate HS2 services from Edinburgh and Glasgow to northern cities such as Manchester, Leeds and Liverpool, in addition to Birmingham and London as currently proposed.

All 3 issues could be resolved by the construction of a cross-border high speed line, following the corridor of the West Coast Main Line and the M6/M74. This would both provide much-needed extra capacity on the existing WCML, and also offer attractive 'high-speed' journey times of well below 3 hours between London and Edinburgh/ Glasgow.

However, construction of a new high speed line through the mountainous terrain of the Cumbrian mountains and the Scottish Southern Uplands would involve huge engineering

difficulties. In many locations, the near-straight high-speed alignments could only be built on the surface with massive environmental impact and exorbitant expense. That would leave tunnelled construction as the only available option.

Engineering studies undertaken by High Speed UK demonstrate that a tunnel around 60km long, mostly built through hard volcanic rock, would be required from south of Kendal to north of Penrith, to avoid the unacceptable impacts of surface construction within either the Lake District National Park or the Yorkshire Dales National Park. Major lengths of tunnelling would also be required in the Scottish Southern Uplands. It is therefore hardly surprising that HS2 Ltd have yet to publish viable proposals for the any HS2 new-build route to Scotland.

Projected Reductions in Existing Intercity Services

The network performance set out in Figure 4.2 is based upon the fundamental assumption that the existing network will retain its existing intercity connectivity, with HS2, Northern Powerhouse Rail and Midlands Rail Hub in place. However, this assumption is belied by projected reductions in existing intercity service levels, that are set out in HS2 Ltd's own documentation.

Table 23 on pp91-92 of HS2 Ltd's *Regional Economic Impacts* report (dated September 2013) sets out the following principal impacts on existing intercity services:

- Frequency reductions on West Coast, Midland and East Coast main lines, affecting services to intermediate cities such as Milton Keynes, Coventry, Stoke, Leicester, Nottingham, Derby, Doncaster.
- Major reductions in scope of CrossCountry network, with a) services to Scotland curtailed north of Newcastle, b) services to Birmingham and destinations further south diverted via proposed HS2 East Midlands Hub and c) further severance resulting from termination of HS2 services at Birmingham Curzon Street, remote from the existing West Midlands hub at New Street.

The degraded intercity links described above are shown in Figure 4.3.

Although HS2 Ltd has subsequently sought to distance itself from the projections set out in its *Regional Economic Impacts* report, it must be emphasised that they are entirely consistent with the segregated and cherry-picking approach taken by HS2 Ltd in the design of its proposals. Their only interest is in building new lines to connect the primary cities such as London, Birmingham and Manchester. This will leave intermediate cities such as Milton Keynes, Coventry and Stoke unable to support existing intercity service levels, and these services will be withdrawn, to be replaced by slower commuter services; and the bypassed cities will slowly regress from vibrant independent commercial centres to dormitory towns.

Figure 4.3 identifies (in orange) the intercity links likely to be affected by the projected service reductions. With the projected curtailment of CrossCountry services at Newcastle, this will have a particularly damaging effect on cross-border links to Edinburgh and Glasgow. With these reductions in place, it is likely that Glasgow will be left with intercity links only to London, Birmingham and Manchester; while Edinburgh will lose its CrossCountry links to Leeds, Sheffield, Derby and Bristol, and will see major reductions in its East Coast services to Newcastle, Darlington, York and Doncaster.

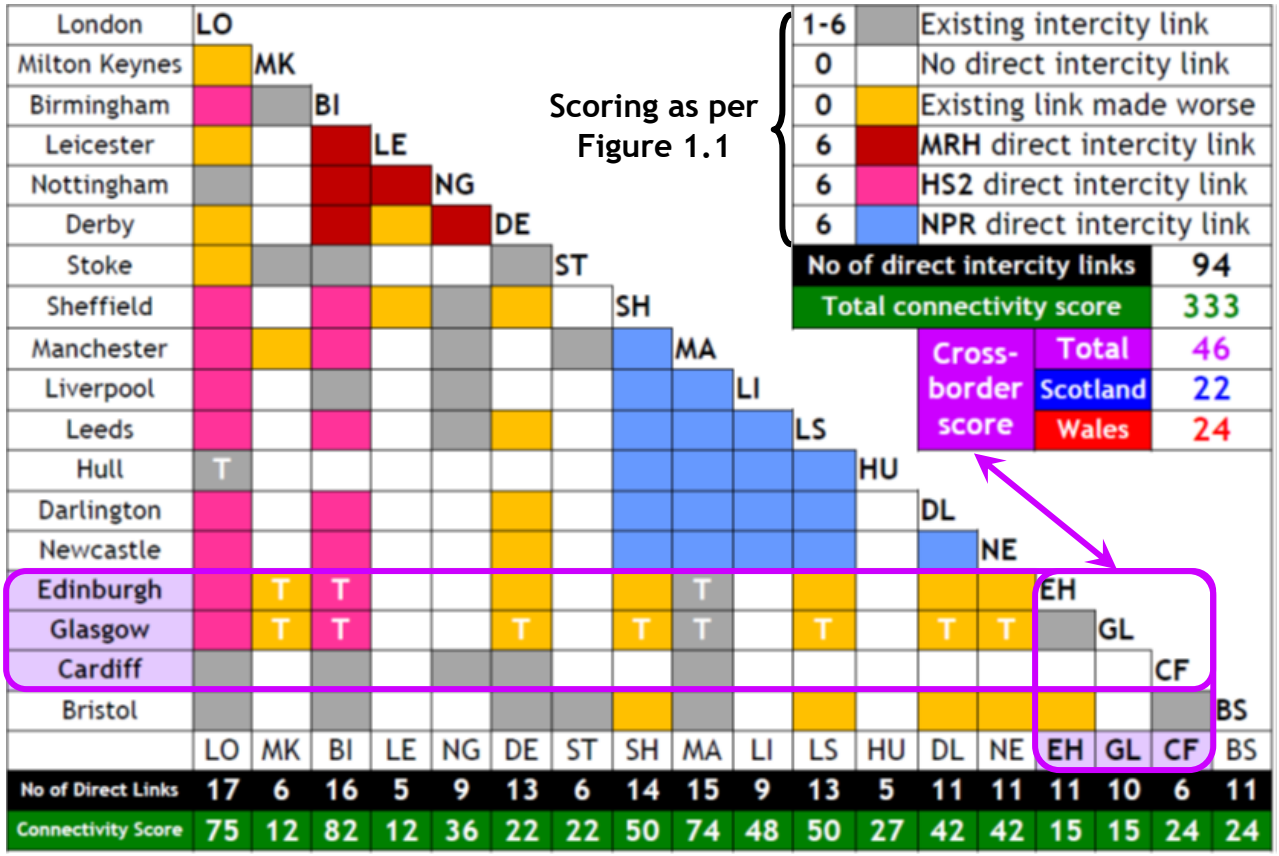


Figure 4.3 : National Network Performance with HS2, NPR and MRH in place, allowing also for likely service reductions on classic network

Overall, the HS2 project seems likely to result in a degradation of Anglo-Scottish services on the existing intercity network, and a major overall connectivity loss for Scottish cities.

All city connectivity scores out of 102	Edinburgh	Glasgow	Cardiff	Total
Existing network	43	22	24	89
HS2 + NPR + MRH + existing network	42	24	24	90
HS2 + NPR + MRH + reduced network	11	11	24	46

Table 4.4 : Summarised Connectivity Scores for Edinburgh, Glasgow and Cardiff

5. What evidence exists to demonstrate the potential impacts of improved transport connectivity between the nations of the United Kingdom?

Please ensure that your answer:

- *relates directly to transport connectivity between the nations of the UK and not to transport connectivity in general*
- *considers economic, social and cultural impacts*
- *provides documents or links*
- *highlights specific potential growth areas such as housing or wages*

The research and design work undertaken in the development of HSUK (see Section 7 of this response) demonstrates clearly that design of a railway system as a network, rather than as a collection of stand-alone high speed lines, is crucial to delivering optimum performance, and, in so doing, delivering optimum links between the individual nations of the United Kingdom.

Only by such a process of optimisation can cross-border connectivity be maximised to deliver a quality of links to Scotland, Wales and other UK regions that matches the quality of the existing (and future, with the completion of HS2) links between London and the principal cities of the Midlands and the North.

A similar process of optimisation is required to improve links to Northern Ireland, although it must be recognised (as discussed in Section 9) that its island location will inevitably limit the quality of links that can be achieved.

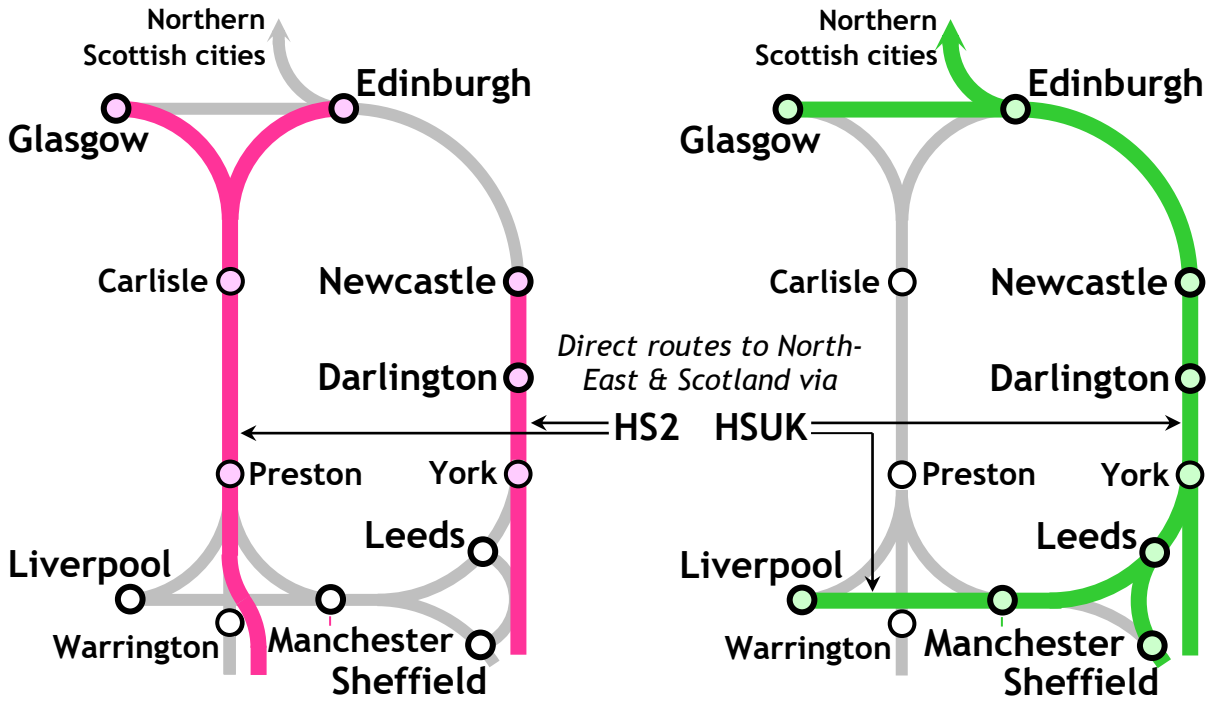
6. When making transport investment decisions that aim to improve connectivity between the different nations of the UK, does the current appraisal framework capture all the potential impacts?

Please provide evidence such as links to existing reviews or analysis that may have already considered this.

As noted previously, all current appraisal frameworks – which appear primarily to be focussed on specific corridors – are fatally compromised by the failure of official transport strategy to address crucial issues of 'network'. As is demonstrated in Section 4 of this response (see Figure 4.3 and Table 4.4), this leaves primary interventions such as HS2 likely to reduce cross-border connectivity, rather than improve it.

However, it is also important to understand the true inefficiency of HS2's links both to the English North-East and to Scotland. Configuration of HS2 as a 'Y-network' leads to separate east-sided services to the North-East, and west-sided services to Scotland, splitting (at Carstairs in Clydesdale) for Edinburgh and Glasgow. See Figure 6.1.

With these 3 separate service strands, it is impossible to sustain frequent services from all major English cities to Edinburgh and Glasgow; in fact, direct HS2 services are proposed only from London (2 services per hour, both splitting at Carstairs) and Birmingham (hourly south of Carstairs, but north of Carstairs split, 2-hourly to Edinburgh and 2-hourly to Glasgow). It is also significant to note that no HS2 services are proposed to extend to more northerly Scottish cities such as Dundee and Aberdeen.



HS2 east-sided route to North-East & west-sided route to Scotland *(NPR routes not shown)*

HSUK unified spine route to North-East & Scotland, also serving northern Scottish cities

Figure 6.1 : HS2 and HSUK routes from English Cities to North-East and Scotland

The scale of HS2's abysmal performance as a network extending to the northern parts of the United Kingdom can only be truly appreciated by comparison with a better-performing 'Exemplar Alternative', configured and designed to radically different principles. The vastly superior connectivity offered by High Speed UK's single spine route to Scotland, also illustrated in Figure 6.1, provides the necessary exemplar.

HSUK's proposed east-sided route to Scotland, passing through Newcastle and Edinburgh en route to Glasgow, will require far fewer trains to operate than the 3 separate service strands required for the HS2 'Y-network'. This offers 4 huge advantages:

- Fewer trains are required to serve the same cities, and this means much higher load factors, much superior economics, and much lower CO_2 emissions per passenger kilometre.
- It also allows the operation of viable frequent services to a much greater range of English cities.
- Newcastle, Edinburgh and Glasgow can be interlinked by frequent high speed services.
- It is also viable to operate high speed services across the Forth Bridge to northern Scottish cities including Aberdeen, Dundee, Perth and Inverness.

Given the acute dysfunctionalities in HS2's proposed routes to the North-East and Scotland, it is difficult to understand how further subsidiary cross-border interventions might remedy the situation, and bring about comprehensive and frequent high speed services interlinking Scottish and English cities. This underlines the crucial importance of the HSUK network-driven approach, as set out in Section 7 and Figures 7.1 and 7.2.

Opportunities for improved transport connectivity between the nations of the UK

7. Which specific journeys would benefit from new or improved transport links?

In your answer, please:

- *identify 2 or more specific points within the UK for each journey*
- *provide details as to why each journey has been identified*
- *list these journeys in order of priority*
- *ensure that these journeys traverse 2 or more nations of the UK.*

If none then please go to question 8.

As noted previously, the improvement of cross-border journeys must be undertaken as part of a much wider enhancement of the national rail network. This is essential if the Government is to achieve all of the public policy goals set out in Section 1 of this response, namely:

- Economic growth from improved transport connectivity;
- Regional rebalancing from greater connectivity between regions;
- CO_2 reductions from step-change road to rail modal shift;
- 'Building back better' after the Covid-19 pandemic.

It would appear self-evident that the scheme that comes closest to the ideal of comprehensive interregional connectivity – and therefore also comprehensive cross-border connectivity – will deliver optimum results against all the public policy goals listed above.

As illustrated in Figures 7.1 and 7.2, the High Speed UK (HSUK) scheme offers a network performance which comes very close to the ideal of comprehensive intercity connectivity, and which vastly outperforms the official HS2, Northern Powerhouse Rail and Midlands Rail Hub proposals (see Figures 4.2 and 4.3).

In terms of cross-border connectivity, the HSUK scheme embodies the following crucial features:

HSUK Dedicated Route to Scotland

As described in Section 6 and Figure 6.1, HSUK's east-sided 'single spine' route, running via Newcastle and Edinburgh to Glasgow, achieves comprehensive links to Scotland from all principal English cities. This is far superior to what the separate west- and east-sided routes proposed for the HS2 'Y-network' can offer.

HSUK Routes to South Wales focussed upon Birmingham New Street

HSUK's routes to Cardiff and South Wales from Midlands and Northern cities will mirror the connectivity of the existing CrossCountry network, all passing through Birmingham. This demands a central through station in Birmingham, for which the existing New Street station represents the only practicable option. HSUK's strategy is therefore aimed at enhancing the capacity of the existing West Midlands network to allow a step-change increase in intercity services from both South Wales and the West Country via Birmingham New Street. These will now extend to all primary cities of the Midlands, the North and Scotland.

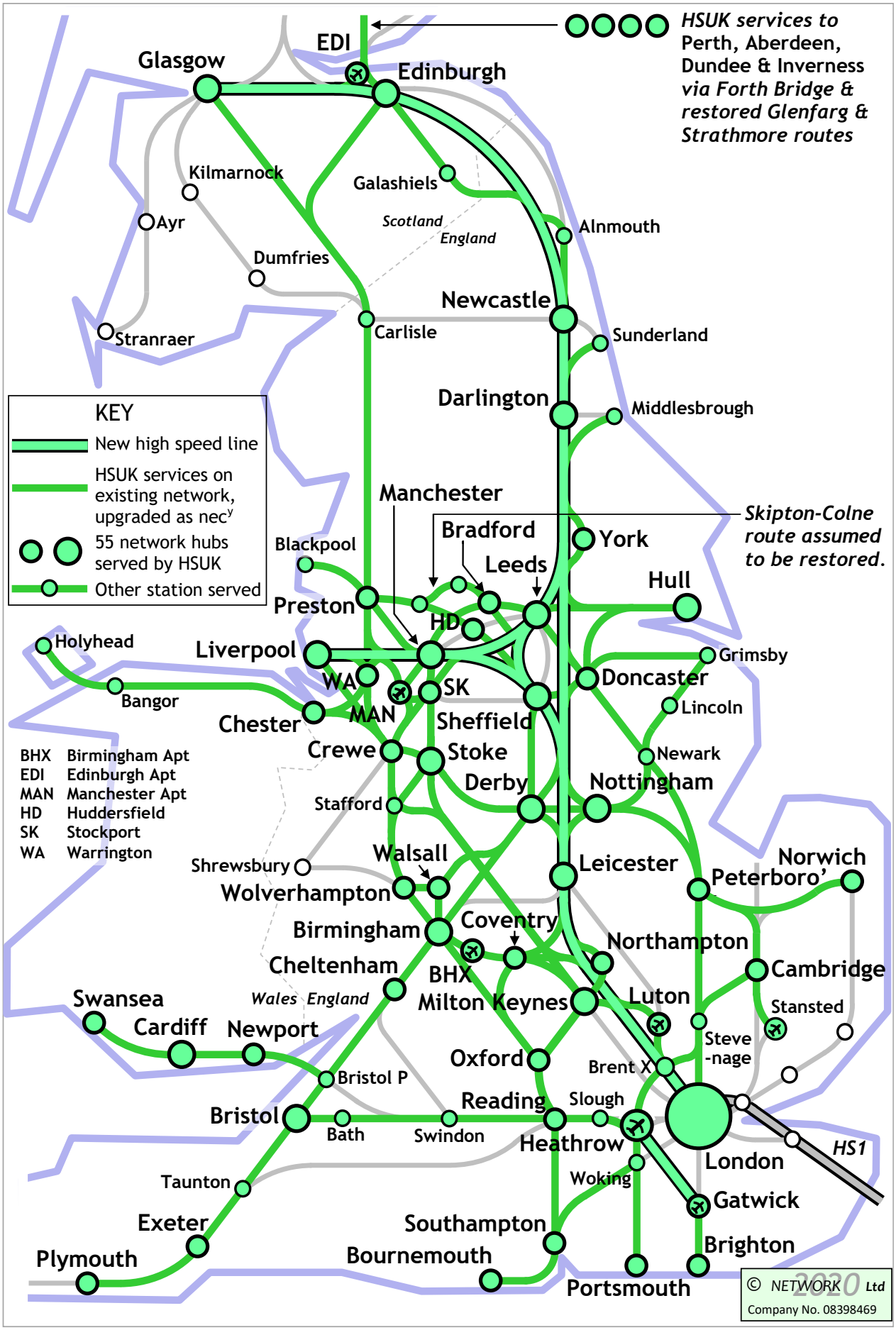


Figure 7.1 : High Speed UK National Network

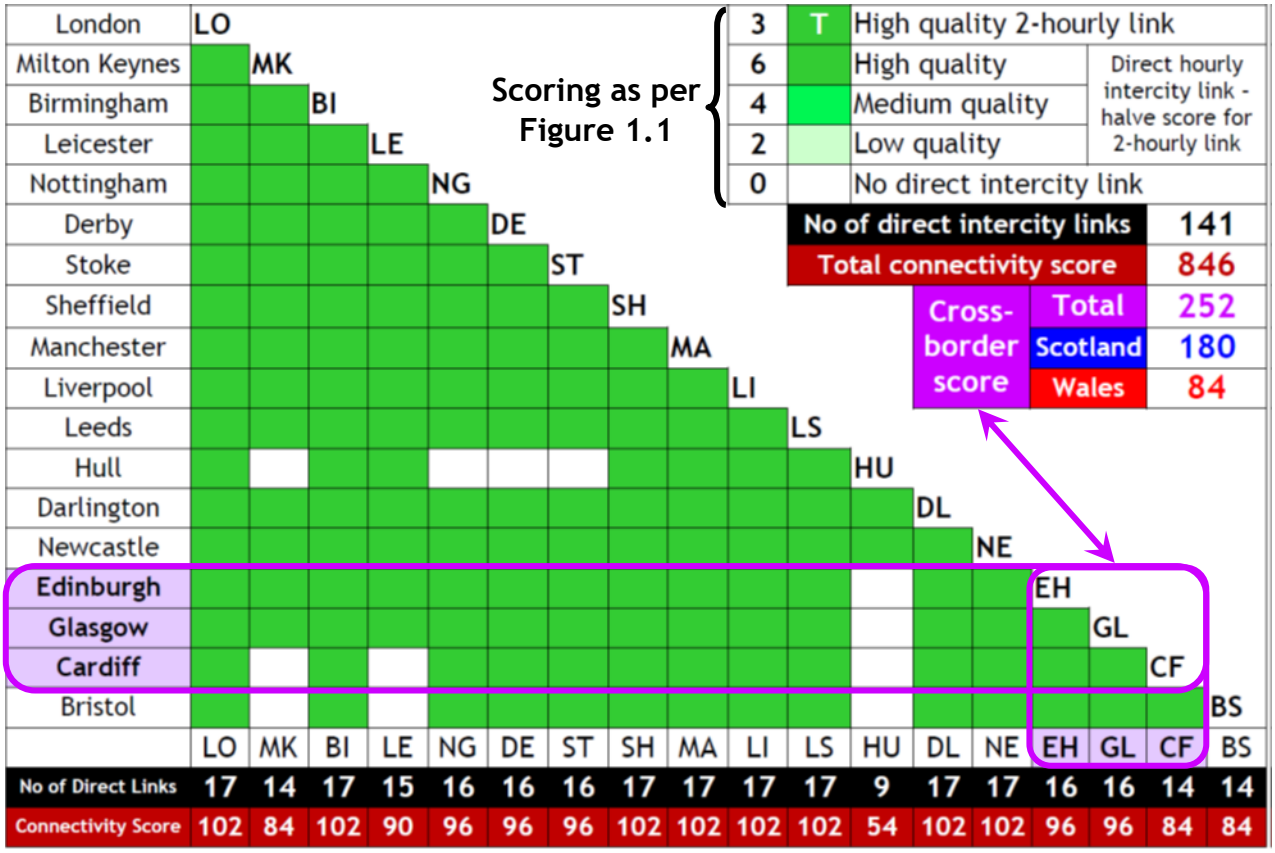


Figure 7.2 : National Network Performance with High Speed UK in place

HSUK's superior network performance is also characterised in its vastly superior cross-border links. As illustrated in Table 7.3 below, HSUK offers a quantum of cross-border connectivity that is an order of magnitude greater than that provided either by the existing network, or by a future 'Integrated Rail Plan' national network (possibly now dubbed 'Great British Railways') based upon the official HS2, Northern Powerhouse Rail and Midlands Rail Hub schemes.

All city connectivity scores out of 102	Edinburgh	Glasgow	Cardiff	Total
Existing network	43	22	24	89
HS2 + NPR + MRH + existing network	42	24	24	90
HS2 + NPR + MRH + reduced network	11	11	24	46
HSUK incorporating existing network	90	90	84	264

Table 7.3 : Summarised Connectivity Scores for Edinburgh, Glasgow and Cardiff

a) What would be the benefits of improvements to these specific journeys?

In your answer, please:

- *provide evidence of the benefit that these proposed improvements would deliver*
- *consider wider economic, social and cultural benefits*
- *consider specific areas such as potential improvements in housing and productivity*

As noted previously, a holistic 'macro' approach is required that recognises the crucial importance of 'network', in order to deliver the greatest societal benefits. Micro-analysis to determine costs and benefits of improving individual journeys, is simply not appropriate.

b) Are you aware of any work that has been done to assess the need or feasibility of improvements to all or part of these specific journeys?

Please provide evidence.

As far as HSUK is aware, there has never been any holistic assessment of how rail routes to Scotland, Wales and Northern Ireland might be improved, in the context of an efficient and optimised national network. In the absence of this work, there would appear to be no chance of any official scheme properly addressing cross-border connectivity between UK nations (or indeed between any UK regions) to deliver optimum and efficient outcomes.

c) How would the costs and benefits of the identified improvements be distributed?

Please consider the economic, social and geographic distribution of these costs and benefits, and provide evidence to support this.

Please see response to Item 7b).

d) How will demand for these journeys change in the future?

In your answer, please consider the:

- *next 20 to 30 years in your response and set out the reasons why demand will change*
- *potential impact of COVID-19*
- *potential impact of the UK's departure from the EU*

Although any of the factors listed above (and similarly, Scottish, Welsh and Northern Irish independence) could change the demand for cross-border and interregional journeys in absolute terms, it is considered that in relative terms the demand will remain driven by the distribution of UK population centres. As noted in Section 2 and Figure 2.1, interregional/cross-border flows are dictated by the magnitude of the populations connected, and by the distance between them.

Under such a model, flows to London – by far the greatest single UK population centre – will remain the largest and most lucrative. However, to achieve all of the Government's public policy goals of:

- Economic growth from improved transport connectivity;
- Regional rebalancing from greater connectivity between regions;
- CO_2 reductions from step-change road to rail modal shift;
- 'Building back better' after the Covid-19 pandemic;

it is necessary to develop the intercity railway network in a holistic manner that facilitates and encourages all of these interregional/cross-border flows. High Speed UK provides the exemplar to demonstrate that this ideal is perfectly practicable and achievable.

e) In your opinion, what is the preferred means by which to improve these journeys?

In your answer, please consider:

- *specific transport modes such as rail, road, air and maritime*
- *details of any new infrastructure requirements*
- *whether there is an opportunity to promote active travel, such as walking or cycling, or environmentally friendly modes of transport*

The strategic network on the island of Great Britain would be primarily based upon electrified railways (only the necessary links to Northern Ireland would be based also around aviation, see Sections 9 and 10 of this response), as the only established technology capable of delivering:

a) the required speed of journeys between major cities;
b) the range of journeys (if correctly configured as a network, interlinking all major cities);
c) the scale/volume appropriate both to a national network, and to high-volume flows between close-spaced major conurbations;
d) the greatest possible energy efficiency and therefore the least CO_2 emissions.

The optimum solution for the national strategic network would be an evolution of the existing network, with existing main lines upgraded around a core skeleton of new high speed lines – almost exactly analogous to the development of the motorway network in the 20th Century.

The HSUK solution set out in Section 7 of this response exactly aligns with this development principle.

f) What would be the environmental impact of improving these journeys in the way that you have identified?

In your answer, please provide evidence and consider:

- *positive and negative impacts*
- *possible mitigations of these*
- *the context of the UK's domestic and international targets for greenhouse gas and carbon emissions*

Any transport development should conform to the principle of 'net environmental gain', whereby the sum of the environmental benefits of the project exceed the sum of its impacts. In the case of a strategic project, the improvements in connectivity and capacity that it delivers should bring about road-to-rail modal shift that should generate greater savings in transport CO_2 emissions, than the increased emissions that will result from its construction and operation. This should prove to be the case for any efficient railway network.

The principle of net environmental gain should extend to the impacts that the railway development causes upon communities and landscapes. These impacts can be minimised by routeing the new line where possible to follow existing transport corridors, by reducing road congestion (and therefore the pressure to build new roads) through modal shift, and by ensuring that the railway development delivers real and measurable transport benefits to the communities that are directly affected by its construction.

g) Are there any interdependencies with other policies that may impact the deliverability of the identified improvements?

In your answer, please:

- *consider all relevant national and regional policies, and those set by devolved administrations*
- *provide your assessment as to how these policies may need to change to facilitate delivery of the identified improvements*

As noted in Section 4, the public policy, to which enhancement of cross-border and wider interregional links should confirm, is fundamentally sound. The problem lies with the competence of the officials, advisors and consultants who have been charged with delivering these enhancements.

8. Is there a need for the development of a national strategic transport network to replace the European Trans-European Transport (TEN-T) network following the end of the UK-EU transition period?

Please consider the specific strategic benefits of a replacement national network, which would connect strategically important regions and places in the UK in order to support economic growth and quality of life. View maps of the existing TEN-T inland waterways and ports and railways and airports network within the UK.

At least in an internal UK context, there is a clear need to supersede the European Trans-European Transport (TEN-T) network. This network – which would seem to be predicated upon the flawed HS2 proposals – is clearly unfit for purpose. It is manifestly London-centric, and it lacks the strong interregional links necessary to promote regional development.

Accordingly, it is necessary to develop a national strategic transport network that meets specific UK needs.

a) How should such a network be defined?

In your answer, please consider:

- *which criteria should be considered when identifying transport links for inclusion*
- *how these criteria should be assessed*
- *which specific transport modes should be included*

It is not considered that there is any need for a 'replacement network', as implied in the Consultation Question 8. The optimum solution for the national strategic network would be an evolution of the existing network, with existing main lines upgraded and abandoned routes restored around a core skeleton of new high speed lines – almost exactly analogous to the development of the motorway network in the 20th Century.

A strategic rail network on the island of Great Britain should conform as closely as possible to the following ideals:

1. Direct (i.e. no change of trains) interconnection between all principal GB population centres, with services of 'intercity' quality operating at hourly or better frequency on all routes.
2. Maximised journey time reductions on all routes, to achieve a more even speed standard and reduce the current speed differential between fast trains from regional cities to London, and much slower speeds between regional cities.
3. Full integration between intercity and local networks at city centre stations, with local networks developed as necessary to ensure maximum access to strategic network from outlying communities.
4. Approaches to hub stations developed to ensure segregation of high speed intercity services from local stopping services, and thus achieve step-change capacity gains for local services – the 'local capacity dividend'.
5. Full compatibility with parallel ambition for national strategic freight network.

The aim of the overall network should be to cover all rail routes in mainland Great Britain, to access the maximum practicable population. The precise dividing line between 'strategic' and 'local' networks is a point for debate, but in general intercity

services on the strategic network should access all cities over 100,000 population, and also all principal airports.

On the island of Great Britain, rail would comprise the primary mode for the strategic national network. However, as discussed in Sections 9 and 10, aviation would continue to comprise the primary mode for journeys to Northern Ireland, with rail providing the necessary feeder services to/from principal regional airports.

b) What would be the potential impact of such a network?

In your answer, please consider possible economic, social and environmental impacts.

A network such as High Speed UK, that is designed with the specific aim of improving links between all major UK cities, including all relevant cross-border links, seems certain to deliver optimum outcomes on all of the Government's key public policy goals, namely:

- Economic growth from improved transport connectivity;
- Regional rebalancing from greater connectivity between regions;
- CO_2 reductions from step-change road to rail modal shift;
- 'Building back better' after the Covid-19 pandemic.

c) How should a network of this nature be managed or financed?

In your answer, please consider the role of:

- *UK government*
- *devolved administrations*
- *local transport authorities*

A management and finance structure must be developed that promotes the essential aim of a coherent and integrated national network, to achieve the public policy goals listed above. The analysis of costs and benefits must include all the societal, economic and environmental advantages that such a network will bring.

It is important to recognise that current initiatives such as HS2 appear to be based upon a dysfunctional and now-discredited 'franchising' model which has concentrated upon only the most lucrative, and mostly London-centric flows from principal regional cities, and in the process has neglected less lucrative intercity flows. This balkanised franchise model encourages segregated, stand-alone operation, and it is incompatible with any concept of integration and 'network'.

The recent launch of the Government's 'Great British Railways' initiative, with its ambition for 'one connected network', confirms a fundamental change in official transport strategy to a new, more holistic philosophy completely incompatible with established schemes such as HS2.

d) Do you have any further comments on the development of a national strategic transport network?

If the desired outcome is a strategic transport network, then it would seem self-evident that a rigorous design process must be applied in the design of this network, aimed at ensuring that the network achieves optimum performance on a range of

defined criteria – as set out in Item 8a). It is no good developing disjointed corridor-specific projects, and hoping for the best.

Regrettably, this is essentially what has happened on the Government's HS2 project. At no stage in the development of either HS2, Northern Powerhouse Rail or Midlands Rail Hub can any evidence be detected of a structured and holistic effort to design and develop the national rail network to optimise its connectivity.

Connections to Northern Ireland

9. With reference to the unique geographical position of Northern Ireland, please set out how best to improve cross-border transport connectivity with other UK nations

In your answer, please:

- *consider all possible transport options, including maritime, air and rail or road via a fixed link*
- *provide evidence as to the cost, benefits and environmental impact of these options*

The connectivity analysis presented in Figures 1.1, 4.2, 4.3 and 7.2 should also cover Belfast, as the primary city of Northern Ireland. But Northern Ireland's unique island location, separated from the UK's other nations and its other major cities on the island of Great Britain, constitutes a huge impediment to the extension of any new GB high speed rail network to Ireland.

Fundamental Aim of Improved Links to Northern Ireland

Before any solution is identified, it is important to define the fundamental aim of improved cross-border connectivity to Northern Ireland. This should be to extend the connectivity standard of comprehensive, direct, frequent and high-quality intercity links – as defined in Section 8a of this response – to Belfast and Northern Ireland.

Practicality of Fixed Link to Northern Ireland

The first option to be considered should be a physical extension of the GB national rail network to Northern Ireland. Any such extension would only be possible with the construction of a Fixed Link across the Irish Sea between Northern Ireland and Great Britain; and the only remotely practicable location for this Fixed Link would be across the 'North Channel' which separates Northern Ireland and Scotland.

As with other major fixed links, for instance across the Straits of Dover or between the islands of Honshu and Hokkaido in Japan, a bridge is unlikely to prove feasible, owing to the hazard that the bridge piers will pose to navigation, and also to the depth of the seabed in which pier foundations will have to be constructed.

There is little doubt that it would be technically feasible to construct a railway tunnel under the North Channel; this is proven by both the (English) Channel Tunnel and by the subsea tunnel that links Honshu and Hokkaido in Japan. However, there is also little doubt that the construction of a tunnel under the North Channel would be an even more daunting prospect than the (English) Channel Tunnel:

- A longer sea crossing, of the order of 40km – *likely to become the world's longest subsea tunnel*;
- More difficult geology for any rail tunnel to overcome;
- Much smaller populations being connected.

All these factors combine to raise the costs and lower the benefits of any Fixed Link, relative to the Channel Tunnel. This will inevitably have an adverse impact on the business case.

Fixed Link : Road or Rail?

As with the Channel Tunnel and the Honshu-Hokkaido tunnel, safety considerations will dictate that the Fixed Link would be operated as a railway rather than a road. It would handle through trains from Northern Ireland to the other UK nations, and also 'shuttle' services carrying road vehicles through the tunnel between Larne and Stranraer.

Track Gauge Considerations

The design of any physical connection between the railway networks on either side of the Irish Sea must take into account the clash of track gauge, between Great Britain's standard gauge (1435mm) and Ireland's broader gauge (1600mm). This issue could be resolved by 3 different strategies:

- Conversion of limited sections of Northern Irish network (i.e. Larne-Belfast) to standard gauge – *technically simple but major operational implications for wider railway operations in Northern Ireland*.
- Conversion of limited sections of Northern Irish network (i.e. Larne-Belfast) to dual gauge (i.e. 1435mm and 1600mm) - *technically more complex but operational difficulties largely avoided*.
- Use of dual gauge (i.e. 1435mm and 1600mm) rolling stock, with change point probably at Larne – *this option is commonly used at the French-Spanish border, where standard gauge (i.e. 1435mm) changes to Iberian gauge (i.e. 1668mm).*

Further work would be required to determine the optimum option.

Necessity for Additional Rail Infrastructure on Scottish Mainland

However, the Fixed Link's most critical difficulties lie with the necessary development of major lengths of upgraded or new railway on the Scottish mainland. Both the existing rail route (running northwards to Ayr) and the now abandoned 'Port Road' (running eastwards to Dumfries) are slow and circuitous, and manifestly unsuitable as approach routes to a new Fixed Link to Northern Ireland.

New High Speed Lines in Galloway??

The only practicable solution would be to construct new lines, extending northwards to Ayr (or further), and also extending eastwards towards Dumfries and the English border. See Figure 9.1. Given the mountainous topography of the Galloway peninsula (which of course accounts for the circuitous routes that currently exist), major cost and massive environmental impact seem certain.

This raises another, more political issue. As current progress with the HS2 project indicates, it is very difficult to persuade local communities to accept the construction of intrusive high speed lines which will deliver no local benefit, and instead cause severe environmental impact. For a high speed line constructed through the Galloway peninsula to link England and Northern Ireland, environmental impacts upon the local Scottish people would appear to represent a totally impossible political proposition.

Figure 9.1 : Strategic Rail Links to Belfast via new Fixed Link, HS2 and NPR

New High Speed Line following WCML/M6 corridor linking to HS2

New, higher speed lines constructed in the Galloway peninsula are of course only part of the railway solution required to connect a Northern Ireland Fixed Link to Great Britain's strategic rail network. The route running eastwards through Galloway would also need to connect to an HS2 north-south route following the corridor of the West Coast Main Line (and the M6 motorway), to reach England's main population centres.

Currently, it is intended that HS2 services to Scotland will be routed along the existing WCML, from the projected end of the new-build high speed line near Wigan in Lancashire, all the way to Glasgow and Edinburgh. As noted in Section 4, this route is already under severe capacity pressure, and it cannot accommodate all the services necessary to provide comprehensive links between Scottish and English primary cities.

Hence it seems certain that the existing West Coast Main Line would not also be able to accommodate additional services to Northern Ireland. This would have the effect of compelling the construction of a cross-border high speed line, and this line would logically extend to Edinburgh and Glasgow, as well as to Belfast. As already noted in Section 4, huge engineering, environmental and cost issues surround the potential construction of this line, and HS2 Ltd has yet to publish viable detailed proposals.

Overall Extent of Fixed Link Rail Infrastructure on GB Mainland

The likely overall extent of Fixed Link infrastructure on the Great British mainland is set out in Figure 9.1. This identifies the infrastructure developments needed for direct links from Belfast along the following routes:

- Belfast-Ayr-Glasgow-Edinburgh
- Belfast-Carlisle-Newcastle
- Belfast-Carlisle-Preston-Manchester-Leeds-Hull
- Belfast-Carlisle-Preston-Birmingham
- Belfast-Carlisle-Preston-Old Oak Common-London

These routes would necessitate the construction of around 450km of new high(er) speed lines, as set out in Table 9.2. This length of new construction must be viewed in the context of the 530km of new high speed line that is projected for the HS2 'Y-network'. Effectively, the putative Fixed Link to Northern Ireland would nearly double the physical scope of the HS2 'Y-network'.

Section	Larne-Stranraer	Stranraer-Ayr	Stranraer-Gretna	Gretna-Wigan	Total
Type	Tunnel/Bridge	Open/Tunnel	Open/Tunnel	Open/Tunnel	
Length	60km	70km	150km	170km	450km

Table 9.2 : New-build Infrastructure required for Fixed Link

On this basis alone – even before:

- any cost estimates have been compiled; or
- the political and technical difficulties have been properly explored; or
- the viability of the multiple intercity rail routes from Belfast listed above (which still fail to offer comprehensive direct links from Belfast to all GB primary cities) have been properly established;

the Fixed Link must be judged as having highly dubious viability.

It must also be noted that most of the infrastructure improvements illustrated in Figure 9.1 would be dedicated to the specific purpose of the Fixed Link to Northern Ireland. This must have severe implications for the business case for such a link, and it would seem very difficult to sustain.

Enhanced Road Infrastructure in Galloway??

The introduction of a Fixed Link with highly likely to a 'shuttle' operation for road vehicles would seem certain to greatly increase traffic along both key strategic routes through the Galloway peninsula – the A77 to Ayr and the A75 to Dumfries. The resulting congestion will require major enhancement of existing road infrastructure.

Enhancements to Existing Sea Links??

Enhancements to existing sea links (from Belfast to Liverpool and from Belfast to Cairnryan) appear incapable of delivering either the required speed, frequency, or the reliability of journey. There would also be major problems in achieving high-quality links between the ferry ports (Liverpool Docks and Cairnryan) and the nearest main line stations (Liverpool Lime Street and Stranraer Harbour).

Development of a Combined Air/Rail Solution for Northern Ireland

This would seem to leave short-haul aviation as the only practicable avenue for development. However, existing air links are infrequent, and are compromised by poor onward connectivity to many UK regional cities.

It is necessary to develop a combined air/rail solution for strategic links from Northern Ireland to the Great Britain mainland. See Figure 9.3. This would comprise:

- primary routes from Belfast to principal GB mainland airports;
- onward rail links to access most major GB population centres.

Heathrow, Birmingham, Manchester, Edinburgh and Cardiff Airports have been selected as 'principal GB airports', to cover the South, the Midlands, the North, Scotland and (South) Wales respectively; routes from Belfast to these airports should be able to support a high frequency of service, ideally hourly or 2-hourly.

All 5 airports are either currently served by rail, or are located close to existing main lines from which airport links could be developed. The HSUK scheme for a national high speed rail network includes radical proposals to transform rail access to all of these GB airports. From these airports, enhanced rail services would radiate to all principal population centres in each region/nation.

In Northern Ireland, Belfast International Airport is the obvious selection as the key regional/national airport, with the potential for high quality rail links across the Province. The mothballed Antrim-Lisburn line passes close to Belfast International Airport, and it appears practicable to develop direct airport links to Belfast and to all major Northern Irish communities that are currently connected to the Northern Ireland Railways (NIR) network. A southward direct link to Dublin would also be possible.

The HSUK Combined Air/Rail Solution for links between Great Britain and Northern Ireland is illustrated in Figure 9.3, and tabulated in Table 9.4.

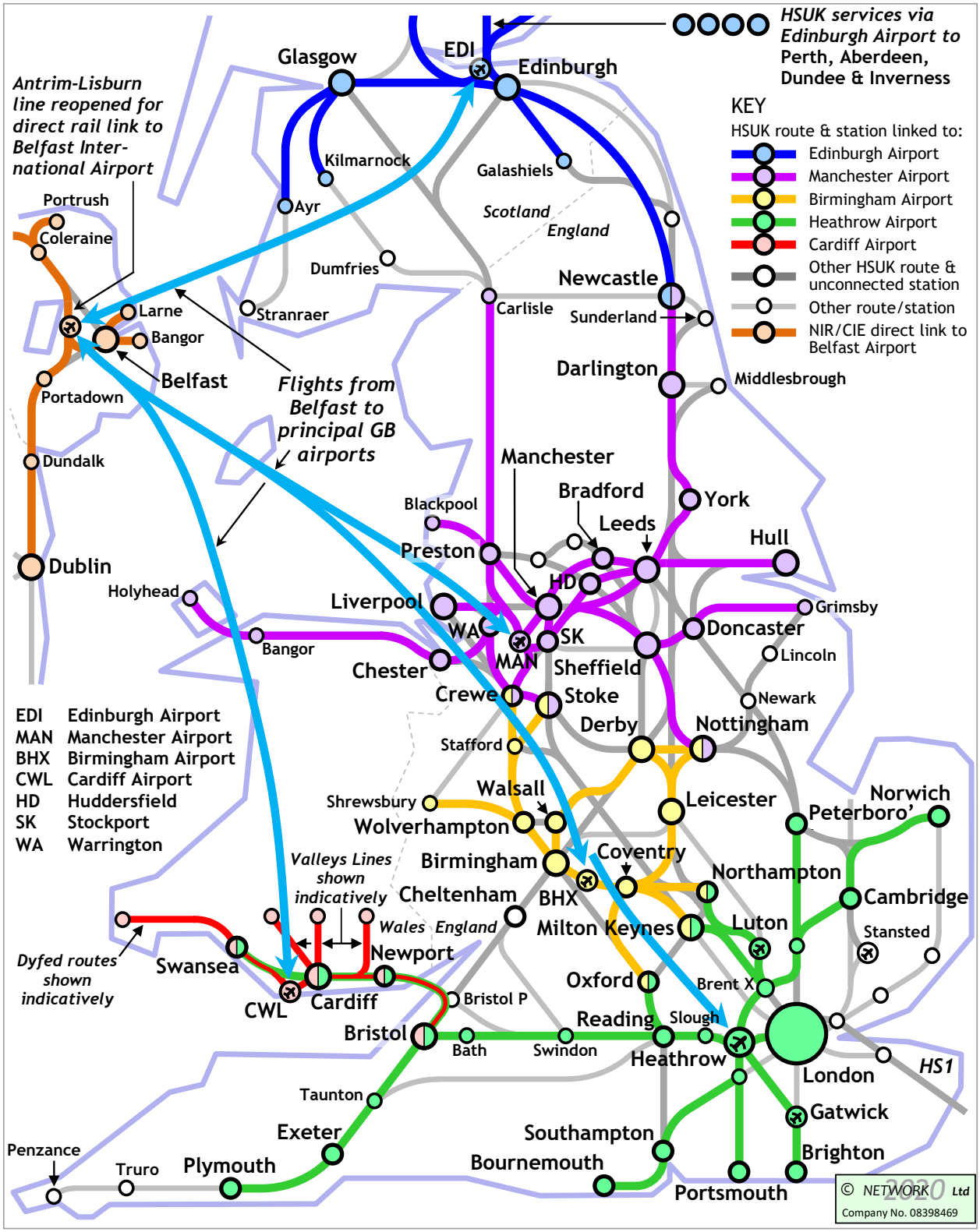


Figure 9.3 : Strategic Air/Rail Links from Belfast to UK Regional Cities via HSUK

Air links from **Belfast** to:	Onward hourly direct rail links to principal cities:	Onward hourly direct rail links to other major cities:
Heathrow (LHR)	**London; Milton Keynes; Bristol; Cardiff**	Oxford; Luton; Peterborough; Brighton; Cambridge; Norwich; Newport; Swansea; Exeter; Plymouth; Reading; Southampton; Bournemouth; Portsmouth
Birmingham (BHX)	**Birmingham; Leicester; Nottingham; Derby; Stoke; Milton Keynes**	Oxford; Luton; Northampton; Coventry; Walsall; Wolverhampton; Crewe; Mid Wales
Manchester (MAN)	**Stoke; Sheffield; Manchester; Liverpool; Leeds; Hull; Darlington; Newcastle**	Crewe; Chester; Doncaster; Stockport; Warrington; Preston; Huddersfield; Bradford; York; North Wales Coast
Edinburgh (EDI)	**Edinburgh; Glasgow**	Perth; Dundee; Aberdeen; Inverness
Cardiff (CWL)	**Cardiff; Bristol**	Swansea; Newport; Welsh Valleys

Table 9.4 : Strategic Air/Rail Links from Belfast to GB Regional Cities via HSUK

Assessment of Performance of Combined Air/Rail Solution

The proposed HSUK Combined Air/Rail Solution illustrated in Figure 9.3 should be assessed against the fundamental requirement for comprehensive, direct, frequent and high-quality intercity links from Northern Ireland to the primary cities of England, Scotland and Wales.

Table 9.5 demonstrates that the HSUK Combined Air/Rail Solution for links to Belfast/Northern Ireland meets most standards for an optimised intercity network, and as such should be capable of supporting the Government's key public policy aims of:

- Economic growth from improved transport connectivity;
- Regional rebalancing from greater connectivity between regions;
- CO_2 reductions from step-change road to rail modal shift;
- 'Building back better' after the Covid-19 pandemic.

Comprehensive Links?	The HSUK Combined Air/Rail Solution **wi**ll extend to all principal GB cities.
Direct Links?	All links from Belfast International Airport to principal GB cities will require a single plane-to-train change at either Heathrow, Birmingham, Manchester, Edinburgh and Cardiff Airports.
Frequent Links?	Air links from Belfast to principal GB airports will operate at either hourly or 2-hourly frequencies. Onward rail links to GB cities will operate at hourly frequency.
High Quality Links?	It seems reasonable to classify both the proposed air and rail links, and also the plane-to-train interchange, as being of 'intercity' quality.

Table 9.5 : Performance of HSUK Combined Air/Rail Solution

Applicability of Combined Air/Rail Solution to Other International Links

It should be noted that the model of connectivity embodied in HSUK's Combined Air/Rail Solution is applicable not only to air links to Northern Ireland, but also to a range of other nearby countries, for instance the Republic of Ireland (Dublin), Scandinavia and many other near-European neighbours. Air links to the Isle of Man and the Channel Islands would also see major benefit.

This concept of multiple-use infrastructure is hugely beneficial for the business case for the HSUK Combined Air/Rail Solution between Great Britain and Northern Ireland, with no infrastructure dedicated to this specific purpose.

10. Other than geographic, are there any other specific restrictions to improving connectivity between Northern Ireland and other UK nations?

In your answer, please consider:

- *legal, policy and practical restrictions*
- *set these out and provide evidence as to how they may limit opportunities for improved transport connectivity*
- *the above in the context of the UK's departure from the EU*

Issues arising from future Scottish Independence and EU Membership

Establishment of improved rail/air links to Northern Ireland, as described in Section 9 above, eliminates the risk that might attach to a surface Fixed Link from any future move towards Scottish independence.

If Scotland were to gain its independence, and then decide to rejoin the EU, a Fixed Link from England to Northern Ireland (both outside the EU) routed via Scotland (within the EU) would require border controls/customs clearance at both Larne/Stranraer (on the Northern Ireland/Scotland border) and Gretna Green (on the Scotland/England border). This arrangement would involve huge bureaucracy and delays, and is plainly impracticable.

Equally, the construction of intrusive and environmentally damaging infrastructure within Scotland, to facilitate a Fixed Link between England and Northern Ireland, would plainly be politically unacceptable.

Environmental Implications of HSUK Combined Air/Rail Solution

Given aviation's high carbon impact relative to rail transport, there are clear environmental implications in any adoption of short-haul aviation as the primary mode for cross-border links between Northern Ireland and Great Britain.

Whatever transport solution is adopted should be capable of justification as the solution with the lowest CO_2 profile. The following issues must be considered:

- the operational CO_2 emissions associated with both air links and onward rail links of the HSUK Combined Air/Rail Solution;
- the CO_2 emissions associated with the construction and operation of any Fixed Link to Northern Ireland, and all necessary approach infrastructure;
- the CO_2 emissions associated with residual air links that would remain after completion of the Fixed Link.

Along with other UK transport initiatives, it would seem certain that the HSUK Combined Air/Rail Solution would need to meet contemporary 'Net Zero' requirements (as set out in *Decarbonising Transport: A Better, Greener Britain*, DfT, July 2021). This would compel the development of a genuinely sustainable source of aviation fuel; it seems highly unlikely that current offsetting strategies or biofuel sources (e.g. palm oil or chip pan oil) would prove either viable or sustainable.

This challenge of course is not unique to the HSUK Combined Air/Rail Solution; it applies to every other transport activity which requires the burning of fossil fuel, for instance all other domestic and international aviation, plus internal combustion engine powered cars and trains. It demands the comprehensive development of battery-powered road transport and electrified railways. However it is clear that the decarbonisation of aviation represents by far the greatest challenge.

Final questions

11. What else can be done to support greater transport connectivity between the nations of the UK?

No further comment.

12. Do you have any further comments?

The recently published (March 2021) preliminary report of the Union Connectivity Review should set out a strategy by which the primary cities of Scotland, Wales and Northern Ireland (i.e. Edinburgh, Glasgow, Cardiff and Belfast) could be tied into a transformed national network, and thus remedy the historic disconnect between the UK nations.

However, the report sets out no such strategy, still less does it establish any core specification to define how the overall UK network should perform, or display any understanding of how this network might be optimised. Instead it merely sets out a predictable list of minor incremental schemes that will do virtually nothing to promote the unity of the United Kingdom or counter the tendency toward separatism.

This is not in any way to question the legitimacy of the Nationalist movements in Scotland, Wales and Northern Ireland; the principle of self-determination, or 'nationalism by choice', has been at the heart of every international treaty since Versailles. However, the continuing failure, of official Government initiatives to deliver the necessary transformation in transport links to the outlying UK nations, or even to specify how these links should perform, effectively constitutes an unwitting but still unforgiveable 'nationalism by neglect'.

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