

High Speed UK 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 DfT prompts in red : All HSUK responses in black

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;
- CO₂ 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 deplors 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:

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

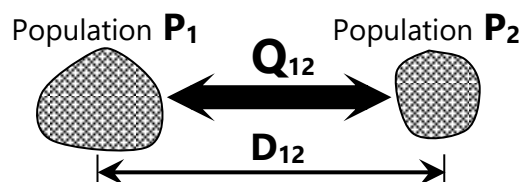


Figure 2.1 : Idealised Modelling of Intercity Flows

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;
- CO₂ 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'.

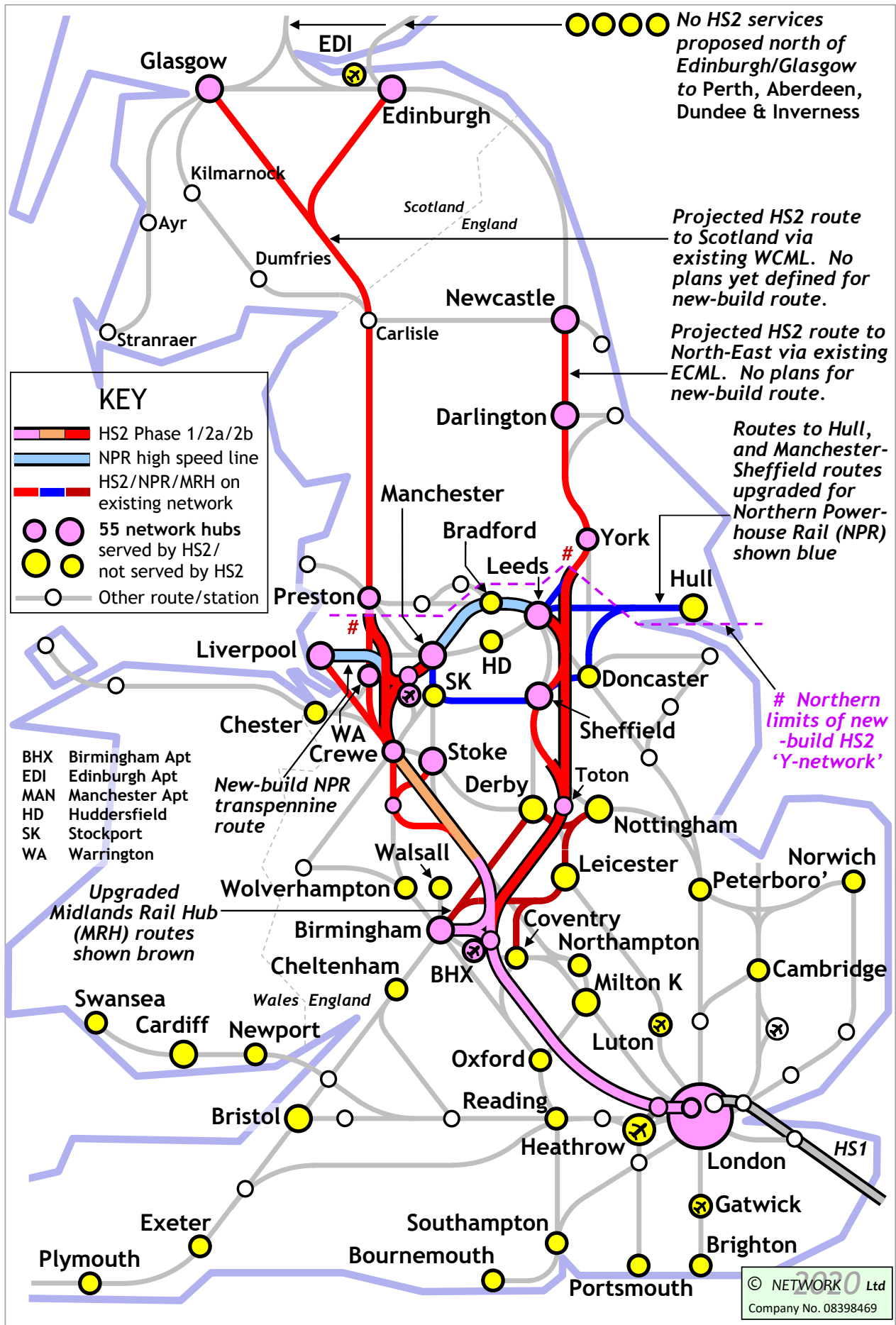


Figure 4.1 : National Network with HS2, NPR and MRH in place

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.

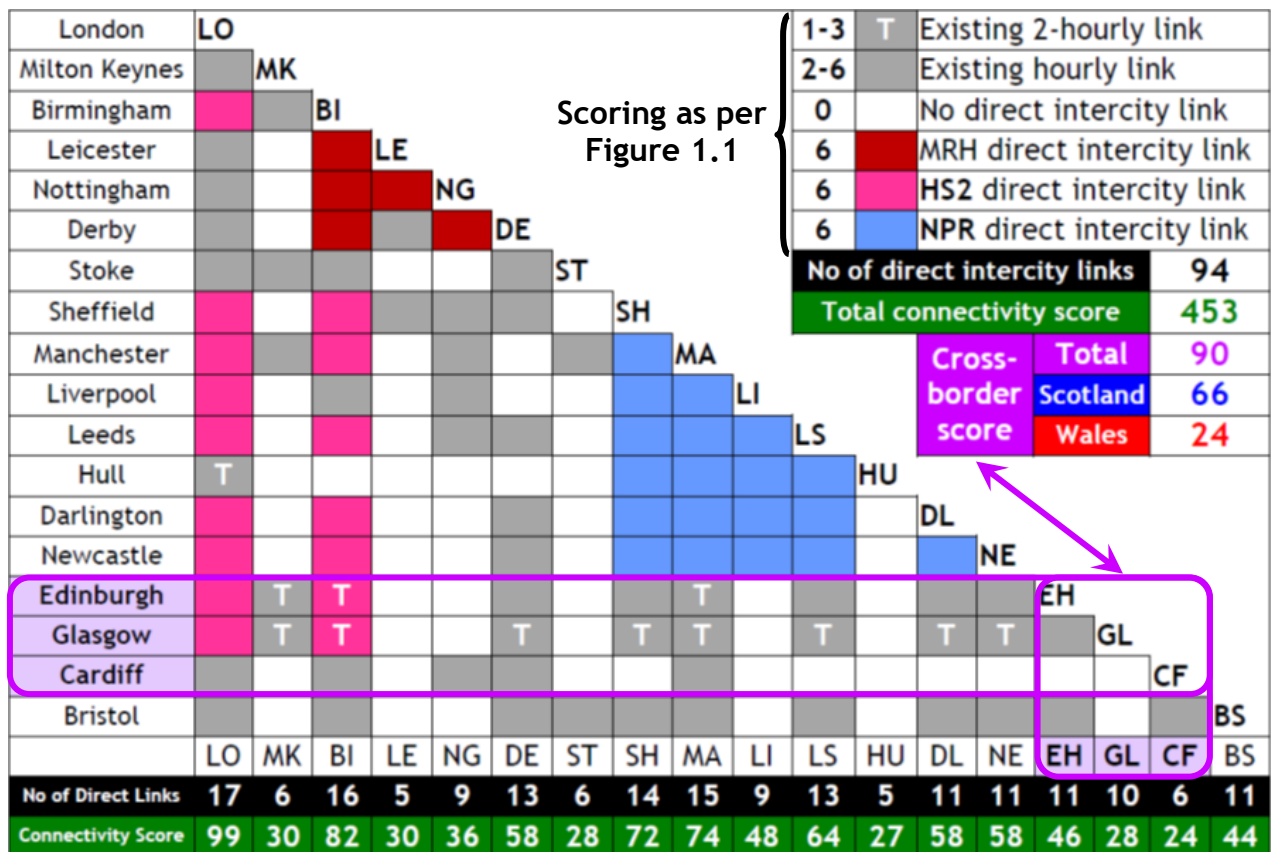


Figure 4.2 : National Network Performance with HS2, NPR and MRH in place

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.

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.

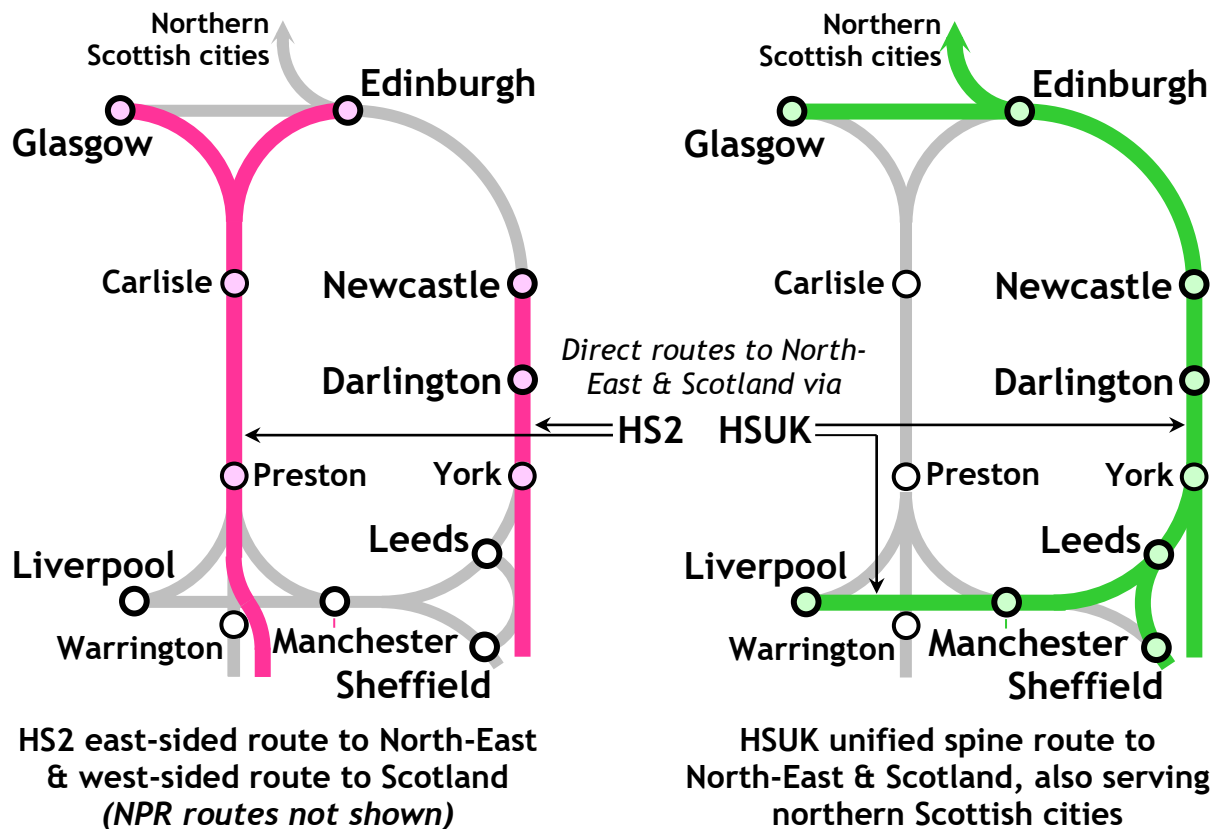


Figure 6.1 : HS2 and HSUK routes from English Cities to North-East and Scotland

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 CO₂ 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;
- CO₂ 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.

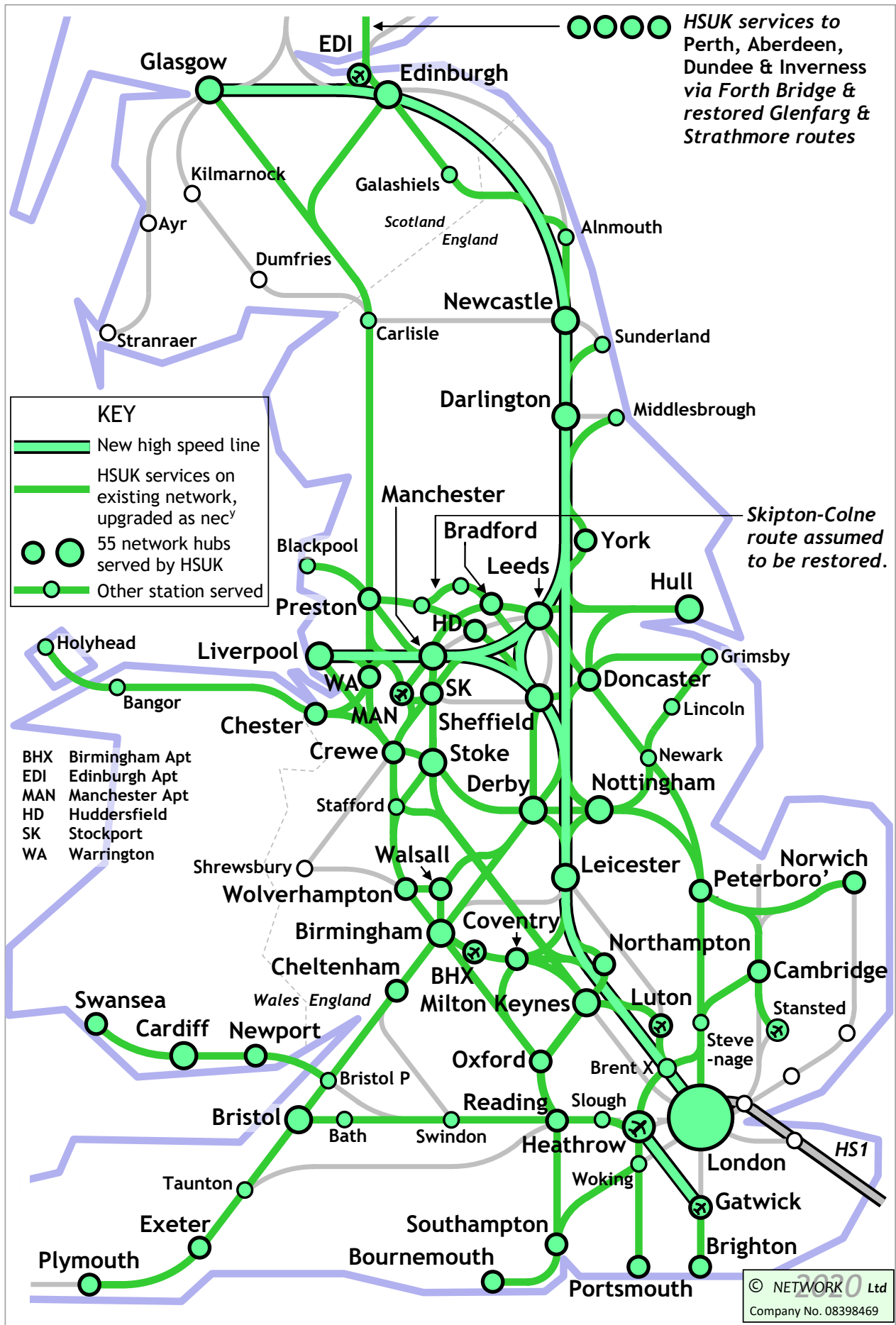


Figure 7.1 : High Speed UK National Network

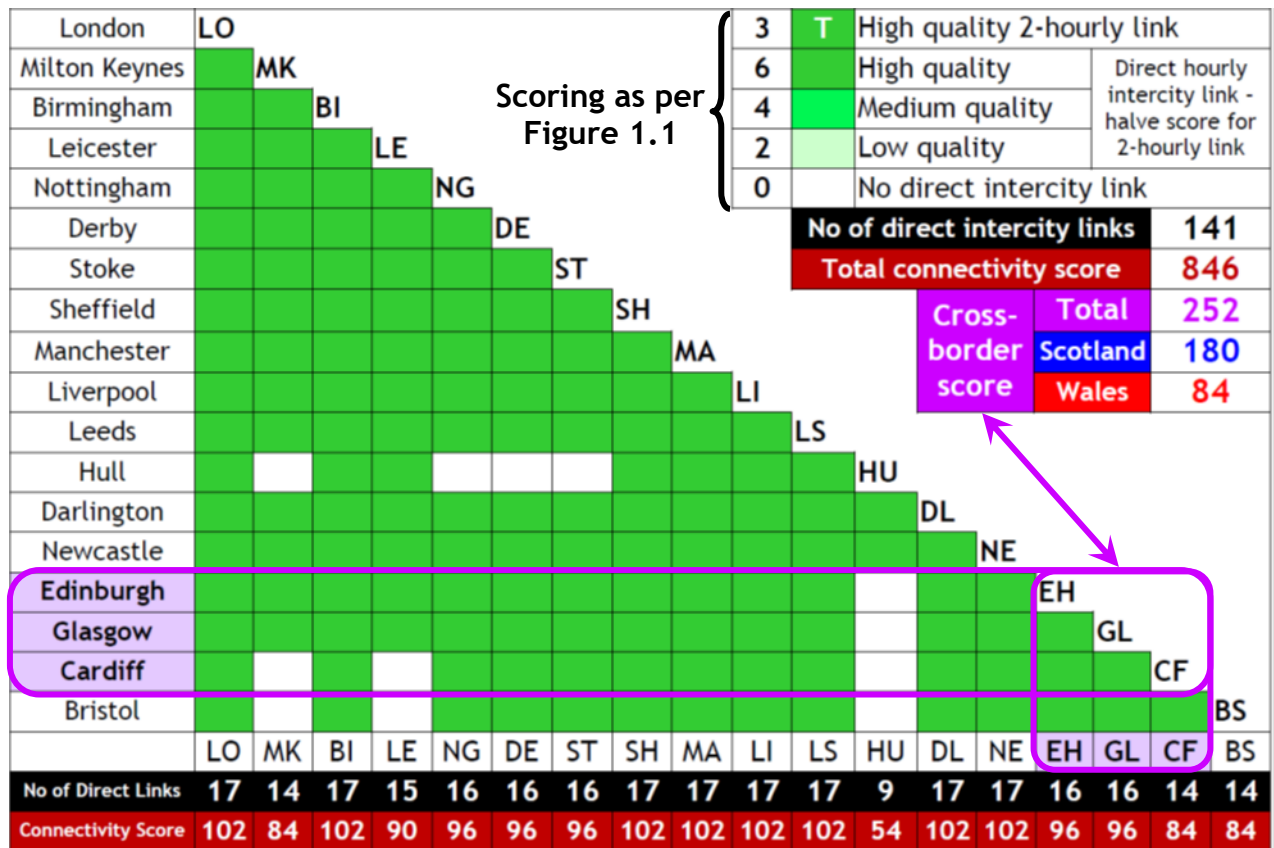


Figure 7.2 : National Network Performance with High Speed UK in place

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;
- CO₂ 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 CO₂ 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 generating greater savings in transport CO₂ 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 routing 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;
- CO₂ 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 9.3A/B, and tabulated in Table 9.4.

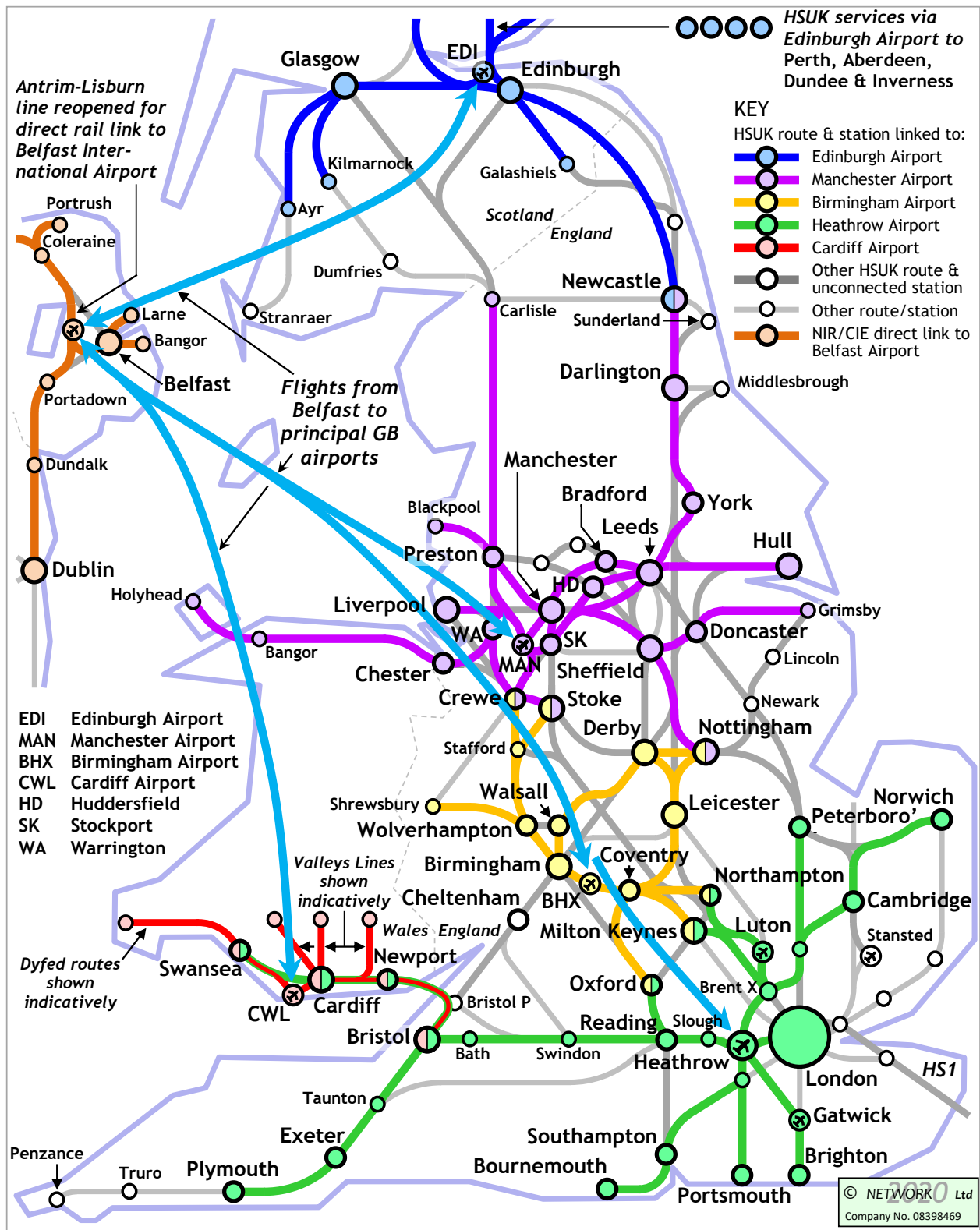


Figure 9.3A : Strategic Air/Rail Links from Belfast to UK Regional Cities via HSUK
(Drawing submitted with original 2021 Union Connectivity Review submission)

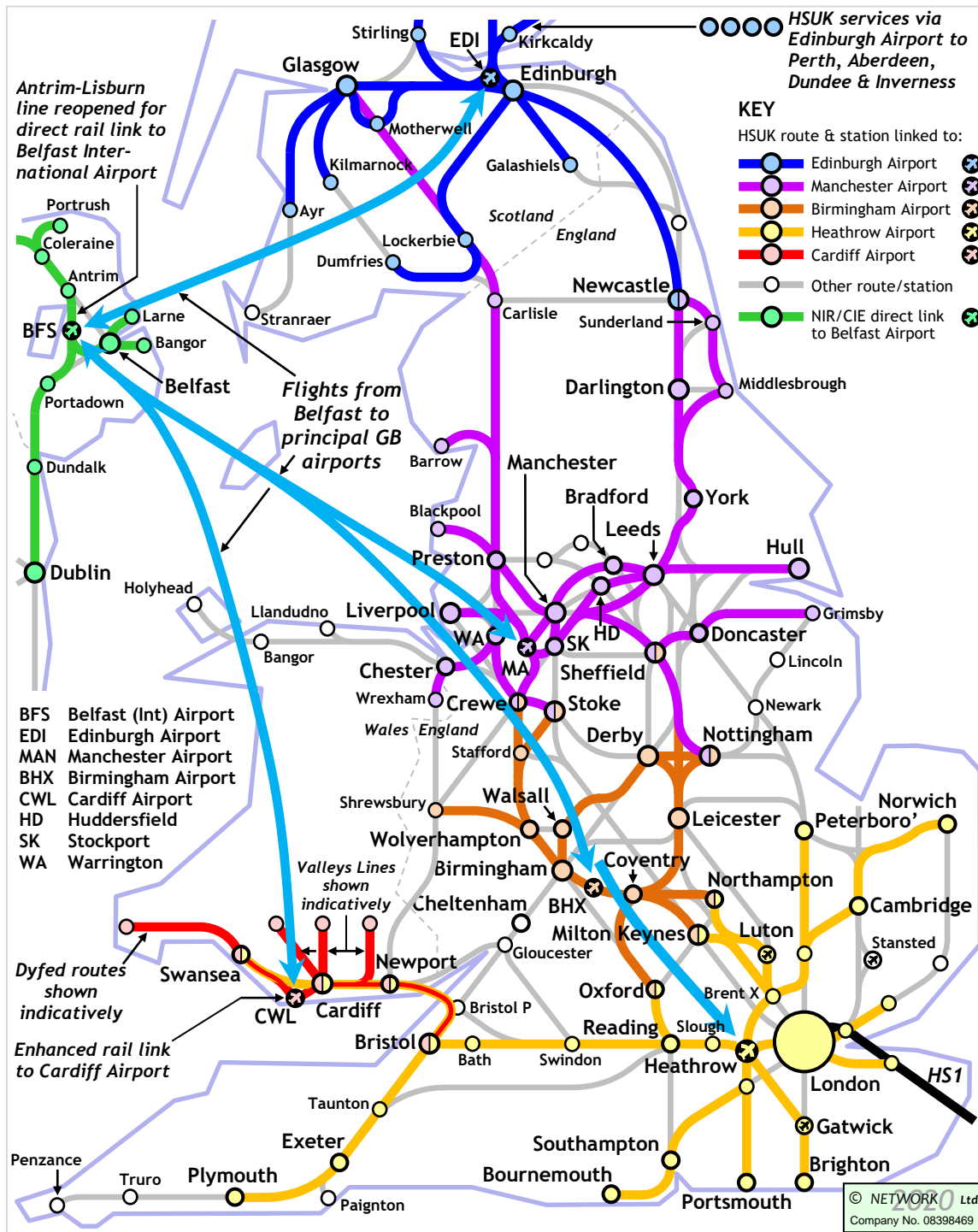


Figure 9.3B : Strategic Air/Rail Links from Belfast to UK Regional Cities via HSUK
 (Drawing revised 2024 to reflect current HSUK proposals)

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;
- CO₂ 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 will 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 CO₂ profile. The following issues must be considered:

- the operational CO₂ emissions associated with both air links and onward rail links of the HSUK Combined Air/Rail Solution;
- the CO₂ emissions associated with the construction and operation of any Fixed Link to Northern Ireland, and all necessary approach infrastructure;
- the CO₂ 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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