

HS2 fails the Network Design Challenge

HS2's fundamental objective, of delivering "hugely enhanced capacity and connectivity" between the UK's major conurbations, cannot possibly be achieved unless HS2 is designed to work in harmony with the existing railway system, to form a single integrated network.

This demands that:

- A coherent attempt is made to design and develop HS2 as a network (page 2).
- The HS2 'network' is designed and developed to a structured set of principles (page 4).
- A timetable is developed to illustrate how HS2 and the wider rail system will operate in practice, and what connectivity and journey time reductions they can offer (page 6).

HS2 fails the Network Design test

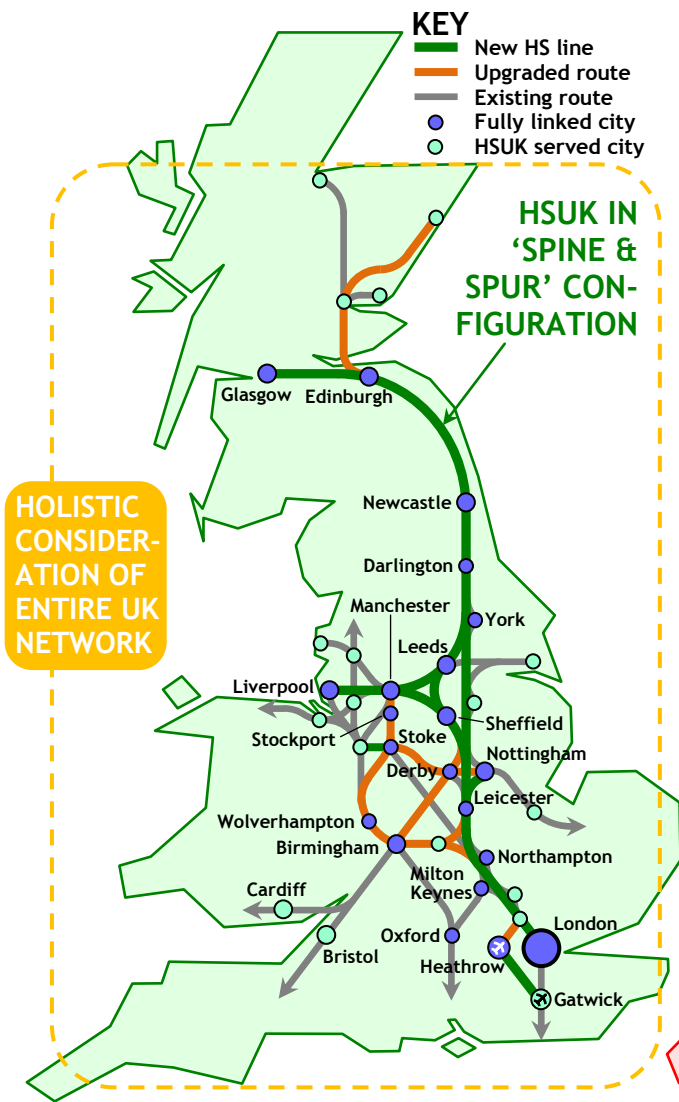
HS2 Ltd's proposals for new high speed lines from London to Birmingham, Manchester and Leeds are frequently described as the 'Y network'. But nowhere in HS2 Ltd's many reports can any structured consideration be found, of how such a 'network' might be developed to deliver the "hugely enhanced capacity and connectivity" between the UK's major conurbations, which of course is the fundamental self-imposed aim of the HS2 project. Instead, HS2's routes have been set with no apparent concept of how they fit into, or might enhance, the overall national network.

HS2 Ltd's own reports confirm that the HS2 route from London to the West Midlands was determined ***with no consideration of how it might develop into an optimised national network*** – yet this first phase would become the stem of all options subsequently considered by HS2 Ltd as candidate schemes for a national network of high speed lines. The unstructured process by which the HS2 'Y' developed is summarised on the diagram opposite, and contrasted with the more holistic approach adopted by High Speed UK.

It would seem self-evident that a scheme (such as HSUK) which fully interconnects all major conurbations with high speed services operating at hourly or better frequencies is better than one that does not; yet this most basic analysis – or even ambition – is conspicuous by its absence. Instead, any option (such as HSUK) that failed to comply with HS2's London-West Midlands first phase route was excluded from consideration.

All this represents a massive technical and intellectual failure on the part of those leading the HS2 project, with no recognition that:

- The true objective of the UK high speed rail project must be an optimised national network that delivers the greatest possible enhancement in capacity and connectivity to the greatest possible proportion of the population;
- A railway network is just another design output that is capable of optimisation by those with the necessary competence who should, at the very least, be able to distinguish an efficient network from an inefficient network.

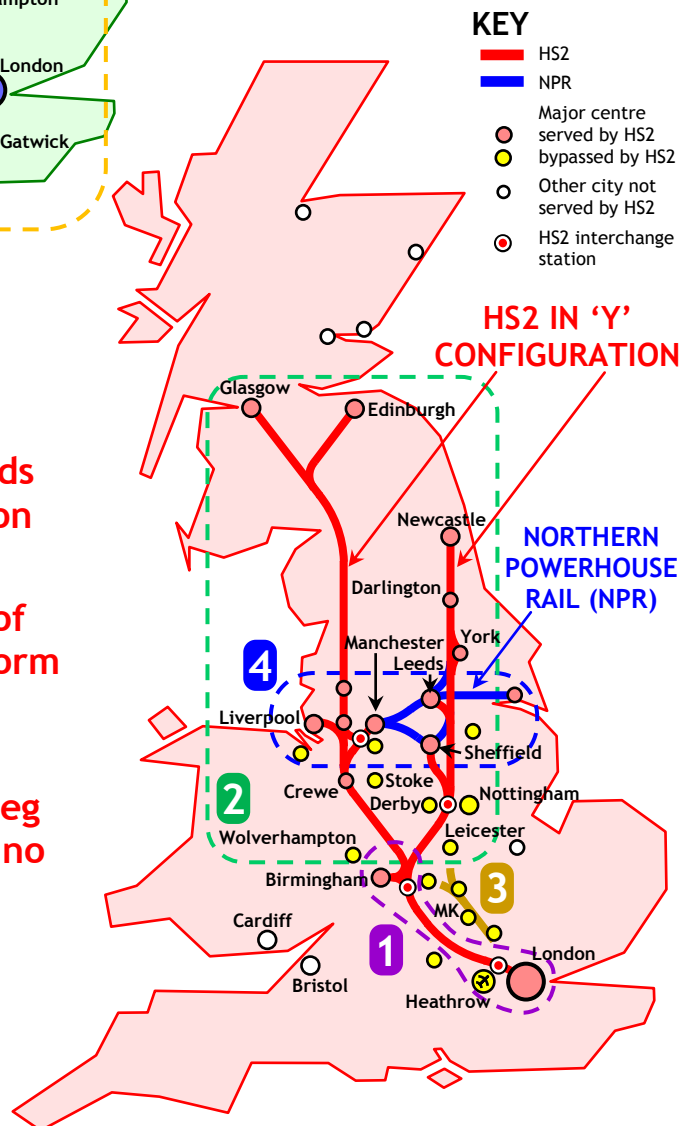


HSUK Network Design Process

1. Start with aim of using high speed rail to create enhanced national network directly inter-linking 10 primary cities plus Heathrow Airport.
2. Develop national timetable of high speed services fully integrated with existing network.
3. Succeed by achieving full interconnectivity for 20 cities plus Heathrow.

HS2 (& NPR) Network Design 'Process'

1. Design London-West Midlands HS line with no consideration of national network. 1
2. Predicate all development of further route sections (to form 'Y') on HS2 London-West Midlands first phase. 2
3. Reject alternative options (eg HSUK) via M1 corridor with no detailed study. 3
4. Partly remedy lack of connectivity of the 'Y' with transpennine NPR. 4
5. Call it all a network!!



HS2 fails the 'Six Principles' Test

HS2 can only deliver its primary objective, of "hugely enhanced capacity and connectivity" between the UK's major conurbations, if it operates in harmony with existing main lines, to create a network. However, HS2 is to be built and operated largely segregated from the existing network and this will make efficient network operation difficult if not impossible to achieve.

This critical contradiction has gone entirely unrecognised by HS2's supporters, who continue to describe the proposals as the 'Y network'. There is no indication, in any of the detailed reports that have been published in support of HS2, of any structured attempt to design HS2 as a national network or to optimise its performance as the core element of any national network.

Instead, it seems simply to have been assumed that the addition of new high speed lines will bring about an efficient network. This assumption is entirely mistaken. A better and more efficient network will not happen by accident; it will only come about if the new high speed lines are designed from the outset to form a network in conjunction with the existing railway system.

HS2's inability to perform as a network is exposed by High Speed UK's massive superiority in every test set out in this document. HSUK's superior network performance is only possible through designing to a structured set of principles and tests, and these 'Six Principles' are set out on the opposite page.

In view of HS2 Ltd's failure to give any meaningful attention to issues of network performance, it is hardly surprising that HS2 fails every test as a national network.

The High Speed Rail 'Six Principles' Tests

A high speed railway cannot be an end itself. It can only be worth the investment of more than £70bn of public money if it performs as a network, delivering the greatest possible benefit to the greatest possible population. The 'Six Principles' tests set out below enable the relative merits of competing proposals to be objectively assessed.

1. The Intercity Test : Do the HSR proposals perform well as an intercity network?

1.1	12 UK primary cities (<i>incl Bristol & Cardiff</i>) fully interlinked?	HSUK PASS	HS2 FAIL
1.2	Frequent interconnections with existing network?	HSUK PASS	HS2 FAIL
1.3	Inclusion of second-tier cities?	HSUK PASS	HS2 FAIL
1.4	10 further second-tier cities fully interlinked?	HSUK PASS	HS2 FAIL
1.5	Hourly (or better) frequencies on all routes?	HSUK PASS	HS2 FAIL

2. The Local Interchange Test : Efficient interchange with local networks?

2.1	HS rail services to central stations in all major cities?	HSUK PASS	HS2 FAIL
2.2	Efficient harmonisation with local networks?	HSUK PASS	HS2 FAIL
2.3	Capacity increase to local networks in all primary cities?	HSUK PASS	HS2 FAIL

3. The International Connections Test : Efficient connections to airports and HS1?

3.1	Direct links to Heathrow from all UK primary cities?	HSUK PASS	HS2 FAIL
3.2	Comprehensive direct links to principal regional airports?	HSUK PASS	HS2 FAIL
3.3	Direct link to HS1 with minimal community impact?	HSUK PASS	HS2 FAIL

4. The Freight Test : Potential for development of a parallel National Freight Network?

4.1	Associated strategy for parallel National Freight Network?	HSUK PASS	HS2 FAIL
4.2	Continental gauge (UIC-C) for 'piggyback' lorry traffic?	HSUK PASS	HS2 FAIL
4.3	Transpennine lorry shuttles to address road congestion?	HSUK PASS	HS2 FAIL

5. The Performance Test : Efficient construction, and future-proofed operation?

5.1	Buildability (<i>ie accessibility, sensitivity & easiest topography?</i>)	HSUK BEST PERFORMER	
5.2	Construction sequence (<i>can system be built in regions first?</i>)	HSUK BEST PERFORMER	
5.3	Capacity (<i>does system improve intercity, local & freight capacity?</i>)	HSUK BEST PERFORMER	
5.4	New journey opportunities (<i>to airports, & new regional links</i>)	HSUK BEST PERFORMER	
5.5	Operational viability (<i>has timetable been developed?</i>)	HSUK BEST PERFORMER	
5.6	Journey time reductions (<i>assessed between 32 key centres</i>)	HSUK BEST PERFORMER	
5.7	Resilience (<i>can system cope with planned/unplanned disruption?</i>)	HSUK BEST PERFORMER	
5.8	Network efficiency (<i>max no. of cities linked for fewest trains</i>)	HSUK BEST PERFORMER	
5.9	Future-proofing against demographic changes etc	HSUK BEST PERFORMER	

6. The Public Policy Test : Compliance with all relevant aspects of public policy?

6.1	CO ₂ emissions (<i>conformance with 2008 Climate Change Act?</i>)	HSUK BEST PERFORMER	
6.2	Minimised Environmental Impact	HSUK BEST PERFORMER	
6.3	Inclusivity (<i>accessibility/usefulness to greatest population?</i>)	HSUK BEST PERFORMER	
6.4	Value for money/BCR (<i>greatest economic benefit/least cost?</i>)	HSUK BEST PERFORMER	
6.5	Rebalanced economy (<i>regional 'Powerhouses' created?</i>)	HSUK BEST PERFORMER	
6.6	Profitable railway (<i>considering entire national network</i>)	HSUK BEST PERFORMER	
6.7	Minimised public expenditure (<i>lowest construction cost?</i>)	HSUK BEST PERFORMER	

HS2 fails the Timetable test

It is only possible to evaluate the performance of a railway system through the development of a timetable; but so far, HS2 Ltd has failed to publish any detailed timetable to show how the national rail network will operate with HS2 and NPR in place.

The disconnection of HS2 from the existing network is of course so great that it is probably not possible to develop a meaningful timetable. This supposition is generally supported by the best information currently available i.e. Table 23 from *HS2 Regional Economic Impacts* (report by KPMG for HS2 Ltd, 2013), which lists both new high speed services between the primary cities, and the reduced intercity services on existing main lines.

High Speed UK's route design of over 1,000km of new-build and upgraded railway, and the scheming of over 50 connections to the existing network, has allowed the development of an outline timetable that describes most primary UK intercity services.

This timetable demonstrates HSUK's following key benefits:

- Average 46% journey time reductions;
- Existing CrossCountry and TransPennine intercity routes greatly improved, with a new South Coast to Scotland route via Milton Keynes, the East Midlands and Yorkshire;
- Direct high speed services from all UK primary cities to Heathrow, using existing Heathrow Express platforms;
- All 'Top 20' cities directly interlinked with high speed services operating at hourly or better frequencies;
- Service levels across network maintained or enhanced. Considering 32 key centres, 455 out of 496 possible intercity journeys are improved, and none are made worse;
- Capacity requirements on all routes defined, and the need for a 4-track high speed line from London to South Yorkshire has been conclusively established;
- All intercity journey time targets met for Northern Powerhouse.

HSUK's comprehensively superior network performance is demonstrated on the diagram opposite.

High Speed UK

The HSUK timetable is based on 496 possible journeys between 32 principal stations. ●

This timetable shows:

455 improved by HSUK

41 unimproved

0 made worse

455
41

46% average journey time reduction



HS2 and NPR

HS2 Ltd has developed no timetable. Our assessment of 496 possible journeys between 32 principal stations ● shows:

88 improved by HS2

14 improved by NPR

300 unimproved

94 made worse

88
14
300
94

9% average journey time reduction*

* Effect of journeys improved by NPR and made worse by HS2 not assessed

