

A Review of High Speed 2

**Dissenting Report
by Lord Tony Berkeley
House of Lords**

**Former Deputy Chair of the Review
Group set up by Grant Shapps MP,
Secretary of State for Transport
in August 2019**

5th January 2020

Foreword

By Tony Berkeley, former Deputy Chair of the Oakervee Review into HS2.

In August 2019, the Secretary of State for Transport, Grant Shapps MP, appointed Douglas Oakervee to lead a report into 'whether and how we should proceed' with HS2 Ltd. ahead of the Notice to Proceed' decision for Phase 1 (London to West Midlands) due by the end of 2019.

Douglas Oakervee appointed me as Deputy Chair with a panel of experts to feed into and be consulted on the report's conclusions.

These appointments terminated on 31 October 2019 before the drafting was complete. I and panel members were shown a copy of the then final draft report in early November but were not given any opportunity to request significant changes. I was not asked to sign it as Deputy Chair and informed the Chairman that I did not support its draft conclusions. I wrote to Douglas Oakervee listing my concerns, including a bias towards accepting HS2's evidence in preference to those of others, leading to what I considered to be a critical but supportive recommendation for HS2 Ltd. to continue. I do not believe that the evidence that the Review received supports this view. (See my letter in Appendix 2).

Parts of the draft Review were subsequently leaked to the media in November, but it is not known whether the text leaked was and is the final text, and when and whether it was as submitted by Doug Oakervee to the Secretary of State for Transport.

In addition to my concern over the conclusions reached in the draft Report, I am disappointed that the involvement of officials from HM Treasury and the Department for Transport have not been scrutinized during the Review. Both of these Departments of State have been deeply involved with the project since its inception. Their involvement is illustrated by the contents of the letter from Rt. Hon Patrick McLoughlin MP, then Secretary of State for Transport, to the Rt. Hon George Osborne MP, then Chancellor of the Exchequer, dated 11th May 2016¹ which clearly stated that both departments were well aware of significant cost and delivery time overruns but had agreed to keep these confidential, presumably for fear of adverse parliamentary scrutiny.

The issues identified by the Review Panel and in my letter places officials from the Department for Transport, who have been involved with the Review, in a compromised position of reporting on the activities of their colleagues in the Civil Service, who must accept Authorities said it would be safe to stay some responsibility for the situation requiring the current Secretary of State, Grant Shapps MP to request the Review.

Since I disagreed with some of the conclusions of the draft Review and was not given an opportunity to amend it, I felt it necessary to produce a dissenting report setting out my response to the Terms of Reference, being this 'minority' or 'dissenting' Review Report.

This Report uses some material from early Review drafts prepared during October 2019 but, when the appointments of the Deputy Chair and panel members terminated on 31 October, the Chairman's Report was not complete. Elements of it were, however, leaked to The Times a few days later, so there can be no question of confidentiality of such text. Thus, I do not refer to any final opinion of the Review, since I, and I assume the panel members, will not be permitted access to the final Report until it is published by the Secretary of State for

¹ Letter dated 11th May 2016 from Rt. Patrick McLoughlin MP to the Rt. George Osborne MP

Transport. For all I know, it may be 'further' updated as new 'evidence' emerges to justify its recommendations, or even as a rebuttal of this Dissenting Report.

So, the information and conclusions in this Report are mine. I provide references where possible, but my non-disclosure agreement finished on 31 October and access to documents submitted to the Review was terminated. Thus, I apologise for any resulting omissions or inaccuracies.

Finally, I thank the many people and organisations who have responded with information, submissions or data, with well-argued suggestions or criticisms. They have all helped me in focussing on what should be in this Report and its conclusions. I cannot name them individually, as in some cases this might well prejudice their being consulted or employed by Government in future work.

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House of Lords, 5th January 2020

Lord Tony Berkeley

Tony Berkeley is a Labour member of the House of Lords and has been an opposition Transport Spokesperson. He regularly speaks in the Lords on transport and related matters, challenging governments on policies and investment decisions and is currently a member of a House of Lords Sub-Committee on Trade. He is enthusiastic for more rail infrastructure and services whilst challenging costs and processes.

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He was Public Affairs Manager of Eurotunnel from 1981 until the end of construction of the Channel Tunnel in 1994 and before that was involved in the planning and construction of various major projects around the world. He followed closely the design and construction of HS1 and the TGV Nord in France connecting to the Channel Tunnel.

He is a Member of the Institution of Civil Engineers, Fellow of the Chartered Institute of Transport and Honorary Fellow of the Institution of Mechanical Engineers in the UK. He lives in Cornwall and the Isles of Scilly.



Summary and conclusions

The purpose of this Review is to provide evidence, the pros and cons, to help ministers choose which of the options for HS2, if any, they want to take forward.

Options

HS2 is the wrong and expensive solution to '*making it faster and easier to travel for work and leisure*²' by providing better North South intercity services. Many more people travel to work and leisure on local or regional services, and those in the NPH and MC areas are some of the worst in the country.

There is strong evidence that the greatest need and demand for improved rail services is within the regions, in particular the Northern Power House (NPH) and Midlands Connect (MC) areas, since services to and from London are of better quality, and that HS2, apart from its Northern end within the NPH area, does not help this much. Its stated aim of providing better North-South links is just as likely to attract more jobs from the regions to London than the other way round.

Of the options considered in the Review, the base case for completing HS2 Ltd. is estimated to cost £107bn at 2019 prices.

Reducing its unnecessarily high specification cost could save perhaps £20bn, but mainly on Phase 2B, and omitting Old Oak Common to Euston could save £8bn and be a perfectly good solution for the number of trains (12 to 14) that HS2 Ltd would be able to operate.

Starting HS2 at the Northern end does not work from a timing point of view, and would inevitably leave the land around Phase 1 under blight for perhaps 10 years.

If ministers are minded to help improve the rail network and services in the Midlands and North, this can be achieved by integrated the HS2 Phase 2B lines within the NPH area into the existing network, and improving the Network Rail (NR) lines in the NPH and MC areas by track quadrupling to what it was before the Beeching era cuts. The aim must be to give these areas the same standard of commuting services as there is in the South East whilst, at the same time, improving the existing lines from London northwards. This option would save around £50bn compared to the cost of HS2.

There is a need for the regional and local connectivity and services to be planned in phases with committed funding to give some 'quick wins' before HS2 Ltd. arrives and for HS2 to be redesigned in some places to fit into the regional network plans. There is a growing view amongst economists that far greater economic growth and increases in productivity would be achieved by public investment in rail, road and bus services that increase the "travel to work" areas of our major cities in the Midlands and the North than by any new major north to south high speed intercity services.

The amount of funding required for these regional and local services in the NPH and MC areas is currently being appraised but may well be as high as £39bn – and this is needed to be spent, whatever options for HS2 are chosen.

² HS2 publicity.

The main disadvantages of such a package, relative to HS2 being completed, are in journey times to London which are not so much improved compared to those planned for HS2 and more weekend possessions needed on existing NR lines.

The benefits to Government are that it saves £50bn – but for both the full HS2 ‘Y’ or the above NR option, Government must commit to spending another £50bn on top of the £107bn for HS2 to ensure the benefits to the NPH and MC regions, and phased improvements to intercity connections.

Costs of HS2

The cost of HS2 Phase 1 has risen from £15.1bn in 2016 to £54.5bn at 2019 prices, an increase of 361%.

HS2 has been planned around a specification which is unnecessarily high and expensive for the services needed and for a country much smaller geographically than France, Germany or Italy. HS2 Ltd has designed the scheme for 360/400kph, higher than any other high-speed line in Europe or Japan, and for 18 trains an hour in each direction, when the company itself admits that no other such high-speed line is able to run more than 12 to 14.

HS2 Ltd. then appears to base its forecast revenue and other benefits on this excessive specification to achieve benefits more than twice costs, according to the 2017 Economic Case, suggesting that the scheme provides value for money. However, even before taking into account the much higher scheme costs, the ratio of benefits to costs in the 2017 case is totally false, based as it is on more trains than any other high speed line can operate, on higher speeds, and on trains running full all day with high fare paying passengers than any other high speed line can operate.

Thus, my best estimate is that the HS2 project has a BCR of less than 1, possibly as low 0.6 and therefore ranks as poor value for money when using the Treasury Green Book.

Economic regeneration

HS2 Ltd. claims some significant economic regeneration around stations but there is no evidence that this would not equally come from improved local and regional rail services as opposed to those which enable faster journeys to or from London.

I conclude that economic regeneration around stations will come as much from improved local and regional rail services as oppose to those which enable faster journeys to or from London. Indeed, there is a risk that HS2 is detrimental to these regions, simply drawing more people into London and the South East.

It would also be unwise to base the HS2 business case on attracting significant investment to the essential station facilities.

Traditional Value for Money appraisals for HS2 does not work; government needs to make a choice on whether it believes wider economic benefits will happen whether a scheme will be value for money or not. Proceeding with the project is not supported by BCR results; it must be a government policy decision whether to build it regardless of other priorities for spending £100bn+ or for spending some of the money on a range of local and regional rail services.

The Environment

I believe that, overall, compared to improving existing lines, HS2 is not good for the environment, and HS2 Ltd. has exacerbated the situation by its appalling treatment of

stakeholders, residents, businesses and councils in the areas over which it plans to construct the lines.

Rail freight

HS2 Ltd. claims to free up capacity for rail freight, but DfT's actions to date mean that this may be just an illusion as there is no firm policy evidence of what any freed-up capacity will be used for and the extent to which this will be allocated for rail freight.

HS2 Ltd.

I think that the information disclosed to the Panel raises very serious concerns about the competence of HM Treasury and the Department for Transport, given their involvement in the project as confirmed in Patrick McLoughlin's letter to George Osborne dated 11th May 2016, but also of HS2 Ltd.

All this does not give me confidence either that HS2 Ltd. has the necessary corporate ability to take the project forward, or that the Department for Transport has the correct policies and structures to manage such projects on behalf of the whole government and reporting to Parliament.

On the basis of evidence to date going back some years, I question whether the HS2 Ltd is fit for purpose to deliver Phase 1 if ministers decide it should go ahead.

Parliament was misled

I believe that Parliament has been seriously misled by the failure of HS2 Ltd. and by ministers to report objectively and fairly on costs and programme changes.

Parliament needs one firm figure for the funding envelope at the time when it gives formal approval to cancel or amend a project without wasting large sums of money. If this figure is exceeded at any stage of the project, then ministers must seek a new approval from parliament on the higher figure at a time before it is too late to cancel.

Conclusion

I conclude that HS2 is the wrong and expensive solution to '*making it faster and easier to travel for work and leisure*²' by providing better North South intercity services (which are already good) but not within and around the NPH and MC areas where services are very much worse and demand very much greater.

² HS2 publicity

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1. Introduction

1.1 The HS2 project

HS2 is a new high-speed railway proposed by the UK Government to connect major cities in the UK, linking London, the West Midlands and Leeds, with connections to existing lines to Liverpool, Carlisle, York, Newcastle and Scotland.

Phase One connects London Euston with the West Coast Main: Line at Hansacre and to Phase 2a near Lichfield in Staffordshire. There is also a link from the main route North to Birmingham, with a new station to be built at Curzon St. Other new stations are planned at Birmingham Interchange, linking with the NEC and Birmingham Airport, and at Old Oak Common in West London, including a connection to the Great Western Main Line and the new Elizabeth Line (Crossrail 1).

Phase 2a of HS2 will connect the northern end of Phase One near Lichfield in Staffordshire to Crewe in Cheshire, which will be the start point for Phase 2b (West). This section is approximately 60 km long.

It currently includes two connections to the West Coast Mainline (WCML). The first of these is located at the southern end of Phase 2b and is known as the Hansacre link. It will allow HS2 Ltd. classic compatible trains to provide an hourly service to Stafford, Stoke-on-Trent and Macclesfield, where it will terminate. This train replaces the existing separate Pendolinos to Stafford (final destination Liverpool Lime Street) and Stoke-on-Trent and Macclesfield (final destination Manchester Piccadilly).

The second connection to the WCML is at the northern end near Crewe and is known as the Blakenhall Spur. It will allow classic compatible trains to service the current WCML locations north of Crewe, where these trains will divide. One part of the divided train will serve Runcorn and Liverpool and the other Wigan and Preston and alternately Warrington and Lancaster.

Phase 2a is also the location for a major planned construction railhead and subsequent maintenance base for Phases 2a and 2b (West) at Stone. This would be accessed from the Norton Bridge to Stone Railway which connects the main WCML between Stafford and Crewe to the existing Manchester line, which runs from Colwich junction through Stoke-on-Trent to Manchester.

Phase 2b (West): Crewe to Manchester

The HS2 line runs north from Crewe with its end point at Bamfurlong south of Wigan where it branches into the WCML. As the line passes through Cheshire at Millington, it will branch to Manchester using a triangular junction. At this junction "passive provision" for a link to Liverpool will be constructed enabling the future construction of Northern Powerhouse Rail to link to the HS2 network. The Manchester branch then veers East in a circuitous route around Tatton running past Manchester airport through a station at the airport, with the line then entering a 10-mile (16 km) tunnel, emerging at Ardwick where the line will continue to its terminus at Manchester Piccadilly station.

Phase 2b (East): West Midlands to Leeds

The HS2b line leaves the Phase 1 line Coleshill progressing north east roughly parallel to the M42 motorway, then north between Derby and Nottingham, incorporating the proposed

East Midlands Hub located at Toton. This Hub will serve Derby, Leicester and Nottingham. There will be a parallel spur to the northbound HS2 track using the Midland Main Line from a branch at Clay Cross linking back onto HS2 track east of Grimethorpe. Chesterfield and Sheffield will be served by HS2 classic compatible trains being located on this spur.

Sheffield will be accessed via a spur using existing classic tracks, to the benefit of Chesterfield which will gain a HS2 classic compatible service. A branch will take the HS2 line to new high-speed terminating platforms constructed onto the side of the existing Leeds station.

1.2 Project objectives and history

I have long had concerns about the purpose of HS2. It was originally proposed to increase capacity but the scope then widened by ministers to also provide high-speed rail services between London and the Midlands and the North of the country. However, its purpose is now claimed to be the solution to rail network capacity problems. If it is now intended to solve capacity issues, one must ask where the capacity problems are worst and whether HS2 is the most cost-effective way of dealing with them.

For example, is HS2 the most appropriate solution to relieve the growing demand for commuter travel from Milton Keynes to London? There is conflicting evidence on the extent of the crowding problem south of Rugby, which would be relieved by moving inter-city passengers onto a new line.

If there were strong evidence, then it may show the impact of moving inter-city passengers onto a new line and – crucially – what size ‘pipe’ should be built to accommodate those passengers. Is it 400m trains at 400kph, 18 per hour, or a set of smaller numbers, at least in the first 20 years of operation? Only once you answer this question can you say what type of scheme should be built, if any. In the absence of such evidence, I question whether the above parameters and passenger numbers have been set more to maximise the Benefit Cost Ratio rather than meet future demand in an appropriate manner. It is after all easier, using the Treasury Green Book, to get a higher BCR for gains in speed than for gains in capacity.

There is also the question of whether the need for improved rail services is greatest for intercity travel, for local and regional travel (commuting) or freight. I discuss freight separately, but unless ministers are prepared to allocate funding both for improved intercity travel by high speed line, and improved local and regional services, particularly in the NPH and MC areas, to bring them up to the quality of commuter services in the South East, then a choice may have to be made.

From the many discussions and responses I received, there was a strong preference to having both but, if finance were insufficient, then improved local and regional services came first. The problem here is that the HS2 project is not the most efficient or cost-effective way of delivering these more local improvements. HS2 Ltd. argues that it is an essential element in the economic regeneration of cities and regions. However, the evidence does not extend to whether this is as a result of better services within the commuting catchment area or better services to London, which are already generally good.

I question whether decisions already made to build large office complexes near city stations are really dependent on a high-speed line coming 10 or 20 years hence, rather than on a

good supply of suitable workforce or better commuter services. One can reflect that it is generally the decision makers and politicians who press for better services to and from London which they perhaps use once a week, compared with the workforce who press for better local and regional service which they use every day.

This uncertainty also drives phasing – what capacity should be built now, and what should be reserved for future generations to design in, and where?

1.3 The Oakervee Review

There has been much criticism of the HS2 development plans, compulsory purchase arrangements and cost increases for a number of years, with many Members of Parliament expressing concerns on behalf of their constituents. Perhaps as a result of a new government, in August 2019, the Secretary of State for Transport, Grant Shapps MP, appointed Douglas Oakervee as Chair of an Independent Review to report into ‘whether and how we should proceed’ with HS2 ahead of the ‘Notice to Proceed’ decision for Phase 1 (London to West Midlands) due by the end of 2019. The terms of reference are set out in Appendix 2.

The Chair of the ‘Independent Review’ appointed Lord Berkeley as Deputy Chair and, according to the DfT press release, ‘a panel consisting of Michele Dix, Stephen Glaister, Patrick Harley, Sir Peter Hendy, Andrew Sentance, Andy Street, John Cridland and Tony Travers. Each will focus on a specific area of interest; they will feed in to and be consulted on the report’s conclusions, without having a right of veto in the event that consensus cannot be reached.’

Given the noted specific areas of interest of the panel, and that the Chair was a former Chair of HS2, with the secretariat drawn largely from DfT officials, some of whom were previously working on HS2, it is difficult to argue that the Review was ‘independent’.

Similarly, although there was not time to undertake a formal consultation, several hundred submissions were received from interested parties and made available the chair, deputy chair and panel members. The data was, however, difficult to access and I found that, whereas documentation from HS2 Ltd. and the Department for Transport (DfT) was identified to us by the secretariat, other submissions were often left to us to find.

Appointments by the Chair had an end date of 31st October 2019, and these were not extended even though the drafting of the Report was not completed. At this time, each panel member and the Deputy Chair were invited to read the final draft in the office and make any comments to the Chair. It is not known whether our comments were accepted in the final report which was to be submitted to the Secretary of State for Transport who would decide if or when he would publish it. He did commit, however, to publishing it as soon as he received it.

We were not allowed to retain copies of the draft, and I was not able to agree to the draft recommendations or the basis for the economic analysis, and therefore wrote to the Chair disassociating myself from the draft conclusion and recommendations. My letter to the Chair is in Appendix 1. I reserved the right to publish further comments - this Report - from my more independent perspective.

1.4 Purpose of this Report

The purpose of this Dissenting Report is to provide an evidence and factually based assessment of the HS2 project and whether it should go-ahead, amended or be cancelled. I have tried to provide a response to as much as possible of the Terms of Reference of the Review, but this does not include making recommendations as to what should happen to HS2 as I view this as the role of ministers. In other words, I provide an independent report to ministers for them to make whatever decisions they choose.

In responding to the Terms of Reference of the Oakervee review, I have adopted the following principles.

I sought where possible to obtain independent evidence to enable me to compare and challenge the large amount of evidence produced by HS2 Ltd. and the Department for Transport, and to respond to the Terms of Reference of the Review.

My Review has not been undertaken with any preconceived view on the preferred outcome but only to present to ministers as much information as possible to enable them to decide on the way forward for HS2 Ltd. and, in particular, whether Ministers should authorise the start of construction works on Phase 1.

I have sought to ensure transparency of costs (including enabling works carried out by Network Rail and Highways England) and benefits, as well as independent comparators. The Department for Transport's continuing insistence on confidentiality has prevented DfT and HS2 Ltd. from providing me with as much independent advice as I requested.

A truly independent Report would have required the full co-operation of HM Treasury, the Department for Transport and HS2 Ltd. and its supply chains, in addition to readily available access to independent advisors, without anyone feeling threatened that they might lose out on future government funded work if they participated. Sadly this did not happen.

In this Report, I outline a number of options, ranging from continuing with the whole project to cancelling it, with several in between. What I have also provided are suggestions for meeting the growing demand for improved rail services on existing or improved Network Rail lines as alternatives to part or all of HS2.

There are many issues that need further investigation, but I hope that my conclusions are sufficient to enable ministers to make 'properly informed decisions in the future of Phases 1 and 2 of the project, including the estimated cost and schedule position', as requested in the Review Terms of Reference.

I explore these and other issues within the terms of reference in the chapters that follow.

2. The purpose of HS2

2.1 Introduction

'By helping to bridge the north-south divide it will build a country that works together. The new railway will free up space on congested rail lines... 'It will help deliver a more productive economy, better able to compete on the global stage. By making it faster and easier to travel for work and leisure, HS2 LTD. will increase trade, boost tourism and regenerate towns and cities. Hundreds and thousands of jobs will be supported by Local Authorities' development plans to capitalise on HS2.' Source – HS2 Ltd. publicity 15 December 2017

Given the above publicity, one must ask what has gone wrong, and how can such disasters be avoided again?

For example, how has the cost of Phase 1 of the project escalated from £15.1bn in 2016 to £54.9bn at 2019 prices, an increase of 361%? Similarly, how has the date for project delivery been extended from 2026 to 2030 or even, as has been suggested, 2033 at this late stage in a project development?

How much of this increase is due to poor governance resulting in:

- a failure to define the scope of the project, high-speed travel or capacity increases or both,
- the development of an inappropriate specification, which is unaffordable within the current Government Funding Envelope and which cannot support an effective and acceptable business case,
- been unable to acquire land required for the project in the sequence required for design and construction works to be completed to deliver the original stated completion date for Phase 1, 2026,
- a failure to provide effective engagement, along the entire length of the route, with members of the public, businesses and council who are affected by the delivery of the project,
- a poor supply chain management, leading to escalating prices and the need for repeated bidding of sections of the works, and
- continuity for the entire lifetime of HS2 Ltd. from its incorporation from 2012 to the present time, without any apparent scrutiny or improvement.

Each of these issues suggest that HS2 Ltd. is not a fit and proper vehicle to deliver this project or indeed any other major high-speed railway project. I deal with each of the issues, in greater detail, and the competence of HS2 Ltd., elsewhere in my Report.

Based on realistic estimates of costs and benefits, I believe that the BCR has fallen well below the break-even point of 1:1 and, with a detailed assessment of benefits, could fall to less than 0.6:1. This means that the taxpayer would receive only 60p of return for every pound that is spent on the project, which is clearly a poor investment return.

Similarly, poor governance of HS2 Ltd. has not dealt effectively with the genuine claims of people losing their property and places of business, nor has HS2 Ltd. defined the real impact on communities through which the route passes in the Environmental Statements issued to the public. The adverse economic effect on these communities has, therefore never been quantified or included in the BCR calculations.

HS2 Ltd. has also admitted that the project does not meet the sustainability timescales set down by HM Government; it does not save carbon, particularly critical when rail in general has a good record in this regard.

2.2 The real questions to be asked – and answered.

The questions that need to be asked about HS2 is not whether it should go ahead or not.

The questions should be - what is the demand for improved rail services in the areas served by HS2, and is HS2 the best or only way to meet that demand? Is there an alternative, perhaps cheaper or more appropriate solution?

For the area covered by HS2, we have the NPH stretching perhaps from Liverpool to the Humber, the MC area from the West Midlands and eastwards, and then the North South links to London and further North.

Most people believe that the railways in the NPH and MC areas are very poor compared to the commuter services around London or the intercity services between these areas.

So, supposing that HS2 costs around £100bn, the NPH needs £11bn and the MC area £25bn for their regional rail plans in addition to HS2. A total ask of Government of around £150bn. There is an alternative to HS2 of upgrading existing lines by Network Rail outside the NPH and MC areas of £30bn. Everyone wants all of these! But suppose ministers say that there is only £90bn available. Which would our politicians choose?

The purpose of this Review is to provide evidence, the pros and cons, to help ministers choose which of these options, if any, they want to take forward.

2.3 The HS2 scheme design

The strategic objectives for the scheme have been interpreted in a scheme design, particularly in capacity and speed, longevity and separation from other parts of the UK rail infrastructure; when the objective gradually changed from speed to capacity, the specification did not appear to have been changed to reflect this.

Even now, perhaps five years on from the change in objective, there appears to be an unwillingness on the part of HS2 Ltd. to consider such changes, some of which are described below. Comments from petitioners along the route and some of the Main Works contractors alike, indicate HS2 Ltd.'s unwillingness to address changes to improve the project and that the contractual arrangements between HS2 Ltd. and the supply chain do not facilitate options for change or saving money; there remains over-specification and refusal to contemplate cheaper and better alternatives including at Wendover, at Euston and its approaches, at Stone in Staffordshire, embankment and cutting design, drainage, slab track or ballast and many other examples. All these should have been reviewed and changed when the purpose of HS2 was altered from speed to capacity.

The fact that it does not appear to have happened may be because HS2 Ltd. is still using the services of advisors who created the scheme for ultra-high speed some ten years ago.

2.4 Train frequency and loading

HS2 is designed for 18 trains per hour (tph) ultimately with Phases 2a and 2b, and 10tph in Phase 1. The company modelled 17tph in the full network business case, but neither my fellow panel members nor I have been able to find evidence from any high-speed railway in Europe or Japan where more than 14 tph is regularly timetabled. HS2 Ltd. even provided a paper to the Panel that confirmed this. In addition, a report prepared by SNCF in 2011 stated that it was impossible to run more than 12 tph on the HS2 network.

There remains uncertainty about the provenance of demand, and there are suggestions that the demand, very high speed and design for 18 trains per hour per direction had more to do with improving the BCR than on what passengers actually needed in the areas served. This was illustrated by the answers given by Dr. Nick Bisson of the Department of Transport to the House of Lords Economic Affairs Select Committee on 29th January 2019. 'The 18 trains per hour (tph) is a calculation that comes from the technical capacity of the signalling system, which is one train every two and a half minutes, giving you a theoretical total of 24. The international best practice is that you only timetable to use 75% of that. That is where the 18 trains an hour comes from. It is driven by the technical capability of the railway

control systems. Thus 75% of 18 trains per hour is 12.6 – say 13tph. So, I question why HS2 Ltd. and DfT appear to be happy to base their BCR on the unachievable 18 tph.

In addition to calculating the BCR on a realistic train frequency, the loading of the trains needs, also, to be taken into account.

The Review was shown some evidence of demand and loading of HS2 trains, but since all forecasting of passenger demand is done by the Department for Transport as part of its franchising processes and is therefore confidential. There was no time or opportunity to challenge these.

It is surprising that HS2 Ltd. used a revenue forecast based on 18 or 17 trains per hour per direction, perhaps running full at full fares (see para below), when the company admits that this number is not technical achievable, unless this was done to produce a BCR which looked good even though it was based on a false premise.

2.5 Train speeds

HS2 is designed for 400 to 360kph running. These are higher speeds than used on other high-speed railways in Europe and, although I understand that the cost of the trains will not change very much if the speed is reduced to 320kph, the design of the track and structures certainly will. There is much debate about the merits of slab track and ballast.

The former has a higher capital cost but, on certain ground, lasts longer with less maintenance. However, where the ground is softer, HS2 Ltd. is proposing to support the slab on piles, inevitably at a very high cost. The installation of piles beneath the track in areas with poor load bearing capacity has been likened to building viaduct beneath the ground to carry the railway.

Ballasted track is cheaper to install but needs more frequent maintenance, and it can be replaced very much more easily than slab track. I understand that ballast can only be used when speeds do not exceed 320kph. In France (Paris to Lyon line), there is information that SNCF is now considering retrofitting slab track to run 16tph, but this could take many years and should not be the basis of a business case. One must question why this was thought to be necessary just to get between London and Birmingham, Manchester or Leeds a few minutes more quickly at a high cost penalty.

2.6 Perfection engineering

The demand for perfection also influences the need for high speed grade-separated junctions, unnecessarily wide station platforms and, most importantly, the separation of HS2 Ltd. trains at Leeds, Manchester, Birmingham Curzon St and Euston from other rail services. Most high-speed lines on the continent operate into city centres on conventional lines to save costs and, if possible, operate on through platforms to reduce the dwell time at platforms needed to turn platforms round and the land take needed. All the above stations could have been designed to give maximum through running onto conventional tracks, much to the benefit of passengers, but this was not seen as a priority as HS2 was designed primarily as a 'stand-alone' railway. It may be too late now, but the regions would benefit enormously if such through running could be achieved. The same comments apply to Euston, and options are explored later in paragraph 6.

This standalone railway in a fully segregated network can have advantages in reliability, costs and safety, but HS2 Ltd. also plans to run trains on the Network Rail network. The lines must therefore be designed together, as one network.

Slopes of cuttings and embankments are also designed to be much flatter than is normal for new constructions such as motorways or conventional rail lines. This has resulted in a need for greater land take, which along with higher specification for drainage and structures adds significantly to the costs.

In a submission to the Review Panel, Transport Scotland estimates that savings of between 11% and 42% are possible on new routes by using alternative standards and also taking more account of the underlying geology when designing earthworks.

Thus, the unnecessarily high specification is driving up costs; estimates of savings could range from 10% on phase 1 (without major changes) to perhaps 30% for Phase 2B.

2.7 Fares and ticketing

Government has for years maintained that fares on HS2 will be the same as on the conventional railway. This is not the experience on other high-speed lines where a premium is often charged for going faster. This needs clarifying. In addition, it will be very important for ticketing to be interchangeable between the HS2 trains and regional and local ones. Note that much of the business case for HS2 rests on most inter-city demand shifting from WCML and onto HS2. So, any increase in fares will limit the degree to which people shift onto the new line; however, we know that competing operators will want to compete with HS2 using fares to convince people to use alternative routes

The Williams' Review⁴ established in September 2018 by the then Secretary of State for Transport, Rt. Hon Chris Grayling MP, seeks to look at the structure of the whole rail industry and the way passenger rail services are delivered. The review will make recommendations for reform that prioritise passengers' and taxpayers' interests. Early indications suggest that the current rail franchising and associated ticketing policies have a strong effect on the usage of the railways including unplanned effects on the use of available capacity.

Although the review specifically excludes the investment decision covering the HS2 project, the first item in its terms of reference considering commercial models for the provision of rail services that prioritise the interests of passengers and taxpayers, may well identify improvements on the existing railway network, which go some way towards addressing the issues the HS2 project is intended to resolve.

Any improvements in the provision of better ticketing systems for the public should be taken into account in any business case offered by HS2 Ltd. The documents offered by HS2 Ltd. to the Panel do not address this matter and but should be taken into account in any decisions about the future of the project.

2.8 Funding for alternatives

There is a fear that, if HS2 is part or all cancelled, there will be no budget to fund the alternatives needed on the regional and local lines. It would be easy for the Treasury to cancel the project and allocate the funding to the NHS or Defence. So, this Review is quite clear here; of the options offered as alternative or to reduce costs, I believe that it is essential that ministers make the strongest commitments to whatever alternatives are proposed and accepted to achieve the same objectives for the passengers. Such funding allocations should be seen as separate to those being proposed for the NPH or MC areas. These options are explored further in paragraph 6.

⁴The Williams' Review <https://www.gov.uk/government/consultations/williams-rail-review>

Alternative uses for the HS2 funds including the HS2 recovery or replacement works, works within the NPH, MC areas as well as routes to Newcastle and Carlisle, other works in the North of England and Scotland as well as other generic project designed to save money or reduce costs are included in Appendix 3.

2.9 Environmental considerations

The Terms of reference of the Independent Review do not include environmental issues, but it does seem necessary to consider these particularly in respect to the target of zero carbon by 2050, and covering both the design, the construction works and the operational phase. Some of the issues are set out below.

2.9.1 Review by Baroness Brown of Cambridge

The Review invited Baroness Brown of Cambridge DBE FRS FREng, Vice Chair Committee on Climate Change, Chair Adaptation Committee of the Committee on Climate Change, to comment on HS2.

Her conclusions are summarised:

Review of HS2 Ltd. Project Documents

HS2 Ltd. has an ambitious Environmental Policy and the Environmental Statements for Phases 1, 2a and 2b broadly align with the policy.

The Policy could be strengthened in some areas, with more measurable targets, for example to provide greater assurance about remediation and repair where environmental damage cannot be avoided.

The accompanying documents could be clearer about the nature of the climate change risk assessment that has been carried out, including what specific scenarios for global warming have been addressed, especially in the light of the problems on the West Coast Mainline in Summer 2019. Reviewing these in the context of the new Met Office projections, UKCP18, would be helpful.

The CO₂e emissions calculations appear sensible and conservative in that they do not include avoided road infrastructure. For Phase 1, London to Birmingham, over the first 60 years of the project lifetime the construction emissions exceed the operational emissions savings, but over the full 120-year life savings and construction emissions are almost matched.

Climate change mitigation benefits of a UK High speed rail network

In terms of meeting our Net Zero commitments HS2 is an important project why? as part of a UK high-speed rail network linking Scotland to London and the continent

It has been estimated that shifting one third of the UK's longest freight journeys to rail could save up to around 1MtCO₂e, whilst taking HGVs off the road, something that would become possible with the additional capacity on the network.

Aviation demand management is likely to be needed to meet the 2050 net zero emissions target – modal shift could form an important and acceptable part of this demand management. A well-integrated UK and European high-speed rail network could deliver savings of up to 5MtCO₂e by 2050 if all journeys under 1000km could be shifted to rail. (5MtCO₂e is significant in the context of the need to reduce aviation emissions from levels of 37MtCO₂e today to between 22 and 30MtCO₂e in 2050.)

The European high-speed rail network is developing faster than that in the UK.

In the context of a third runway at Heathrow, it will be particularly important to reduce/eliminate emissions from short-haul flights such as Scotland to London.

HS2 needs seamless connections with UK airports and the Continent/HS1.

I found these comments helpful and note that many of these comments would apply to a greater or lesser extent to the options described in paragraph 6, Options for upgrading the existing rail network instead of building a new line. The key is to divert as much future traffic from other modes to rail.

There are, moreover, a number of unresolved and diverse views on these environmental issues, which would need to be further and properly considered before any final conclusions can be drawn by the Secretary of State.

2.9.2 Does HS2 help to address climate change emergency?

HS2 Ltd. claims that it will be a '*key policy option to encourage lower emission travel; A modal shift from road to rail should be a key rationale for HS2.*'

The extent to which people leave their cars at home and travel by train is influenced by many factors, but significantly by convenience and cost. The most significant moves from car to train is likely to be in regular commuter flows where better services every day will hopefully persuade many people to make the change. These improvements are largely those within the NPH and MC areas, for which HS2 brings only small benefit. An additional disbenefit is the likely increase in people driving cars to HS2 park and ride stations.

For longer journeys such as to London or Scotland, the number of people changing from car to train is likely to be much smaller, as will be the number changing from air to rail between London and Scotland, estimated to be around 10% of an already small number of passengers. It may be that, by connecting airports more effectively to places such as London and Manchester, HS2 may well lead to an increase in flights from Birmingham and Manchester airports, which may lead to an increase in flights in net, as well as gross terms; i.e. even after some flights are redistributed from other airports.

The extent to which the freed-up capacity on the WCML and other routes provides more capacity for freight or other passengers is discussed elsewhere but is dependent on many other factors and cannot really be quantified.

However, negative environmental considerations include:

- the destruction of woodland, and landscape impacts,
- high frequency, heavy trains, where the high speed has driven the use of slab instead of ballast track – worse for environment,
- now that contractors have found ground conditions much worse, the volumes of spoil to be moved has increased drastically, particularly in the greater volumes of spoil to be moved by truck,
- train noise,
- greater power requirements with higher speeds,
- carbon used during construction etc.

The scale of potential emissions savings from high speed rail depends on the extent to which passenger and freight demand can be shifted from higher carbon intensity modes. This in turn depends on the extent and connectivity of the UK's high-speed rail network.

Many of the above could be mitigated if a reduced HS2 specification had been adopted; there is scope for some of these with some of the options considered, but it is also clear that upgrading existing lines, including wide scale electrification. as outlined in paragraph 6 and Appendix 3 would have a much greater environmental benefit.

I conclude that, overall, compared with upgrading existing lines, HS2 is not good for the environment.

2.9.3 Stakeholder engagement

There are many examples of HS2 Ltd. being slow to pay compensation or of avoiding paying 'over the odds' to make the loss of property more palatable.

Damage to environment during construction; bad relations with local residents, etc. were the result of poorly prepared or inaccurate environmental statements as well as the very poor reputation HS2 Ltd. has earned by its botched efforts to acquire land. It is easy to write off complainants as 'Nimbies'; certainly, many people were opposed to HS2 in principle but many more were adversely affected by the manner of HS2's engagement, coupled with an often ignorant and arrogant approach which was not only unnecessary but unprofessional. I comment on this further in paragraph 7.

I provide some examples out of many about poor stakeholder engagement.

Among many interventions on behalf of his constituents, Sir William Cash MP for Stone said *'On the question of environmental impact, I would simply say that my constituents will be deeply and profoundly affected not only by the havoc that will be created by forcing this juggernaut through my constituency from top to bottom, but by the dislocation, the highways and the impact on businesses.'* (Hansard 15 July 2019).

Cheryl Gillan MP reflected the views of residents, businesses and other stakeholders, when she states in a submission to the Review: *'Constituents have expressed frustration with HS2 Ltd. over their sporadic communication, incorrect information, the trivialisation of concerns and the breaking of promises. Constituents have also been left without answers or reassurances from HS2 Ltd, in many cases, I have been required to write to the Secretary of State to ensure a satisfactory response.'*

Even within HS2, the current Chief Operating Officer is quoted in New Civil Engineer, referring to Cheryl Gillan's comments 'this is totally unacceptable for a project of this size and complexity, and reveals a poor culture of management within the project itself.'

Sally Cakebread who lives in Savay Farm in Ruislip, the only inhabited Grade 1 listed building within 300 m for the whole of HS2 including phase 2, met an HS2 Ltd. engineer and asked if he had seen Savay Lake from the ground. The viaduct would cross Savay Lake behind our house, and it is the top fishing lake in England and utterly magical, full of amazing bird and wildlife.' The engineer replied, "No but I've seen lots of aerial shots". 'HS2 Ltd. has positioned it so it damages all the major features within the Colne Valley in Harefield and Denham. Historic Dews Farm in Harefield is due to be demolished... Sadly I witnessed the recent eviction of Ron Ryall from his business by 7 trumped up youngsters (mid 30 max), who were in casual clothes. It was one of the most depressing days of my life. 7 young people to evict a brave man in his 70s who had had that business since a teenager, working on cars.' Nobody seems to have explained to these people the option of making a longer tunnel or moving the line of the route, something that would have been possible with a lower specification.

Stakeholders have been poorly served and often misled by the contents of Environmental Statements issued by HS2 Ltd.; in the absence of detailed measured estimates for the project, the assessment of materials required to be moved through local communities from construction compounds has been inaccurate. Once the works to be carried out from these compounds has been properly assessed by detailed measurement, the quantities requiring movement and the truck journeys required have often exceeded the capacity of local road networks, thus damaging the local environment and economy.

Many other members of parliament have spoken about the poor treatment of their constituents.

Some stakeholders petitioned to one or both Select Committees but found the committees rather daunting and felt that they were generally more inclined to believe HS2.

Such examples are repeated the length of HS2. Some disruption to people's lives and property along the route is inevitable, but the scale, the arrogance and ignorance of many of the HS2 Ltd. people involved compares very badly with the engagement undertaken by HS1 and other projects and brings the whole management and governance into disrepute.

Why has it taken HS2 Ltd. and its owner, the DfT, so long to realise this, and is the present management capable of and intent on achieving the necessary improvements?

2.10 Rail freight.

HS2 Ltd. claims that its new line will free up paths on the West Coast Main Line for other trains, both passenger and freight. This is undoubtedly true in principle, but the extent to which rail freight is able to obtain and use paths on the WCML and elsewhere is more complex.

In 2015 the Centre for Sustainable Road Freight carried out an assessment of the potential for demand side fuel savings in HGVs for the Committee on Climate Change (CCC). This study found that shifting around a third of the longest road freight journeys to a low carbon (e.g. electrified rail) mode could result in greenhouse gas emission savings of 0.3 to 1.1MtCO₂e per annum. The challenge of decarbonising HGVs is one of the more difficult ones as batteries are likely to be too large and heavy; hydrogen has potential but is energy intensive to produce and difficult to store and handle, so a significant shift of freight from road to rail would make a very positive contribution to decarbonisation of road transport by 2050.

The demand for rail freight is clearly affected by changes in the logistics and ports industries and, unlike the provision of passenger trains, freight demand may vary from day to day and week to week as well as seasonally, since freight trains (unlike passenger trains) do not operate unless they have customers. MDS Transmodal are contracted to the Department for Transport to provide annual freight forecasts which give up-to-date information about likely flows and changes in the short and long term. This helps DfT decide where and whether infrastructure enhancements are needed. Unfortunately, DfT did not provide the Review team access to this model to assess likely growth until very late in the Review period but we were shown a draft Report by MDS Transmodal to Network Rail dated April 2019 which provides rail freight forecasts for a number of different scenarios for 2033/4 and 2043/4. Some of the largest flows on the WCML will be North of Nuneaton, so may balance the removal of London to Birmingham trains from the route further South. Between Stafford to Crewe there are more than 75 tpd per direction and south of Nuneaton 50 to 60 tpd.

Looking at freight demand overall, MDS Transmodal concluded that lack of network capacity could lead to 50m tonnes less rail freight in 2050 than would otherwise be the case, and that this would lead to a loss of benefit (user + non user costs) of £12 bn. NPV, or £240/tonne forecast in 2050. That is based on the assumption that lack of capacity otherwise caps rail freight growth in 2025 so the amount of suppressed demand grows each year after that. For an hourly path along the WCML (say 15 trains per day per direction), 280 days p.a., each hauling 500 tonnes of goods containerized goods that equates to 4.2m tonnes p.a which is therefore 'worth' around £1 bn. NPV. Thus, creating an extra hourly path justifies £1 bn. of capex.

However, the extent to which HS2 Ltd. and DfT have so far catered for current or future freight growth is questionable and is of particular concern if DfT is really serious about achieving a low carbon economy; this will not occur unless freight is allowed onto the tracks when and where it needs. For example, for the last year or so, freight has been seeking at least one path per hour across the Pennines, on one of the routes linking Merseyside and Drax and East Coast ports.

In its briefing paper on trans-Pennine freight to the Review, CILT/RFG states that the rate of increase in demand for container traffic trans-Pennine 'has accelerated substantially in the last year and the need is now pressing'. Solutions are offered for both the Diggle and Calder Valley routes which could provide the necessary gauge and capacity capability on an urgent basis, and TfN leadership group should champion these freight enhancements, advising the DfT that 'this is an essential component of the Northern Powerhouse Strategy'.

In spite of vigorous lobbying by the industry, DfT has so far refused to allow such a freight path, preferring to give all six available paths per hour per direction, passenger services; I question whether it really affects passengers if they have to wait 12 minutes rather than 10 minutes for the next train across the Pennines, so long as they get a seat – but that can be solved by longer trains.

Similarly, timetabling on the WCML North of Crewe has shown the mix of franchised services and those from HS2 LTD. to have used up virtually every freight path to the extent that even existing services may be prevented from operating.

Elsewhere, the needs of freight are given low priority on routes such as Felixstowe-Nuneaton, where capacity constraints between Ipswich and Ely still restrict freight flows, and force operators to send their trains on the route to London, the North London Line and West Coast Main Line. There are similar restrictions to freight on the Midland Main Line and Hope Valley lines.

One alternative or additional capacity option was provided to the Review by the proposed GB Freight Route which comprises a high gauge freight railway, largely over former closed railway lines, linking the Channel Tunnel with the Midlands, the North (East and West) and Scotland. Unlike much of HS2, it links closely with existing lines but provides the capacity for growth that will be needed in the future. Parts of it can be built in phases as demand and finance is available, but it is certainly an option for providing for growth, and for the needs of the high gauge container and swap body markets. Recent research by the Rail Freight Group suggested that with the right interventions, rail freight could create £75bn-£90bn in benefits over the coming decade.

To deliver this step change, however, RFG is urging the new Government to commit to a 5-point action plan to ministers to achieve the Government climate change targets: '*put freight*

*customers at the heart of the national rail network; provide capacity for long-term growth; support for rail decarbonisation; recognise the importance of rail terminals in the planning framework and encourage new markets and opportunities for rail freight.*⁵ Without a commitment to these actions, DfT will be seen to be failing rail freight, with or without HS2.

HS2 Ltd. claims to free up capacity for rail freight, but DfT's actions to date mean that this may be just an illusion.

One concern of the rail freight sector is the uncertainty about the future of HS2 Phase 1 has had on their investment plans for rolling stock and staff, where companies have committed⁵ investment to be ready for the large volumes of construction freight likely to be needed to be moved by rail. Similar comments have come from main civil works contractors and there is concern that cancellation or long delays will have serious financial effects on some companies.

Many of these issues are beyond the remit of the HS2 Review. However, they do demonstrate the need for a wider review of the UK rail infrastructure and services and the extent to which they allow for and encourage a low carbon economy to which other parts of the Government appear to have signed up. Although in theory HS2 frees up capacity for freight on the WCML, in practice the planned timetabling and the continuing prioritising of additional passenger services by DfT on many routes means that freight will remain disadvantaged until and unless there are specific upgrades, alternatives or priority train paths provided for freight that cannot be abstracted for passenger use.

For these reasons, it is by no means clear how HS2 can benefit rail freight, unless and until the DfT commits to a UK-wide programme of providing paths for rail freight to meet expected demand, and by putting these freight paths on the timetable before passenger trains.

3. Project Costs and Programme

3.1 Background

In order to maintain consistency, the costs quoted in this Report relate to the land acquisition and construction costs of each phase of the project. They therefore do not include the provision of other necessary items, such as rolling stock, the figures for which are quoted separately.

Unless stated otherwise, the figures all relate to Q1 2015 prices, with estimates of inflation to 2019 mentioned separately. The exceptions are therefore estimates that pre-date 2015, which are based on prices at the time that the estimate was prepared or at an alternative earlier date.

3.2 Government agreed funding envelope

The original February 2011 estimate of the cost of HS2 (excluding rolling stock) was £32 bn. This was based on prices dating from 2009.

This figure was revised upwards to £38.4 bn. in October 2013, with £19.0 bn. allocated to Phase 1 and £19.4 bn. to Phase 2. Another £6.9 bn. was assumed to be required for rolling stock.

⁵ <http://www.rfg.org.uk/level-ambition-achievable-worthwhile-rail-freight-2/>

The long-term funding envelope then increased the project total to £50.1 bn., with Phase One estimate reduced slightly to £17.6 bn.

The current funding envelope and budget for the entire HS2 project was then set in the July 2015 spending review at £55.7 bn. with the following approximate breakdown.

- Phase 1: £27.2 bn.
- Phase 2a: £3.7 bn.
- Phase 2b: £24.8 bn.

The figure of £55.7 bn. has been repeated many times by ministers as the only budget for the project, including most recently as part of the debate of the Third Reading of the Phase 2a Hybrid Bill in the House of Commons on 15 July 2019.

The agreed programme for the delivery of the various HS2 projects assumed Phase 1 completion by the end of December 2026, Phase 2a by the end of October 2027 and Phase 2b in 2033.

3.3 Chairman's Stocktake

3.3.1 Project costs

Allan Cook, who succeeded Sir Terry Morgan as Chairman of HS2 Ltd in December 2018, published his review of the project, entitled *'The Chairman's Stocktake'*, in August 2019. Although much of the detail contained in this publicly available report has been redacted, an un-redacted version was made available to the Review Panel. My view of the difference between the two versions was that the major differences were more to do with avoiding embarrassment than issues of confidentiality.

This report concluded that the HS2 project could no longer be delivered within the available funding envelope of £55.7 bn. and provided a range of alternative costs for each phase, further details of which are given below.

The overall and comparable total cost for delivery of the project was increased to between £72.1 and £78.4 bn. This represents an increase of between 29.4% and 40.8% on the above funding envelope figure. However, when inflation to 2019 is included, the Chairman's Stocktake estimate increases the upper figure to £88 bn. (+58%).

Independent Consultant Michael Byng has reviewed the project costs outlined in the Chairman's Stocktake and has concluded that HS2 Ltd. has underestimated or omitted key elements that would further increase the costs now admitted to by HS2 Ltd. by a further £15 bn. These are summarised as follows:

- £8 bn. for underestimating property purchases costs,
- £3 bn. contribution to the HS2 project power generation and distribution requirements,
- £2 bn. for traction maintenance requirements, and
- £2 bn. contribution to property development costs at London Euston station.

It may be argued that some of these costs are accounted for elsewhere, but I believe that they should be included on the basis that they would not be incurred if HS2 did not go ahead.

A summary of HS2 Ltd.'s estimated costs at the July 2015 spending review and updated by the Chairman's Stocktake is given in Table 3.1.

Table 3.1 HS2 Ltd.'s estimate of costs

Event	Phase One (£bn)	Phase 2a (£bn)	Phase 2b (£bn)	Total (HS2 Project) (£bn)
SR2015 Funding envelope	27.2	3.7	24.8	55.7
2019 Chairman's Stocktake	36.1-38.4	3.6-4.0	32.4-36.0	72.1-78.4
Increase	8.9-11.2	Up to 0.3	7.6-11.2	16.4-22.7

Note: All figures are based on Q1 2015 prices

3.3.2 Project programme

The Chairman's Stocktake has also acknowledged that each phase of the HS2 project will be significantly delayed compared to the approved timescale. Unfortunately, the report is very vague as to the delivery dates, with sometime between 2028 and 2031 cited for the completion of Phase One. This represents a potential delay of between one and five years. Since Phase 2a is stated to be constructed to the same timescale as Phase One, it is assumed that HS2 Ltd. believes that it will be completed within the same 3-4 year-long delivery window.

As for Phase 2b, HS2 Ltd. is now expecting this element to be completed sometime between 2035 and 2040, which represents a delay of between five and seven years.

Such vagueness hardly inspires confidence in HS2 Ltd and its supply chain to deliver the project within budget and programme as has been the much-repeated mantra of Government ministers in recent years.

Table 3.2 HS2 Ltd.'s programme completion dates

Event	Phase One	Phase 2a	Phase 2b	Total (HS2 Project)
SR2015 Funding envelope	Dec 2026	Oct 2027	2033	2033
2019 Chairman's Stocktake	2028-2031	2028-2031	2035-2040	2035-2040
Increase	1-5 years	1-4 years	2-7 years	2-7 years

3.4 Independent estimate

3.4.1 An independent estimate of the costs of the HS2 project has been compiled by Michael Byng in 2017 and has been updated on a regular basis since.

Unlike any of the quoted figures produced by HS2 Ltd. or the DfT, these estimates have been prepared using the 'Rail Method of Measurement' (RMM suite) Volume 1 - Order of Cost Estimating, Cost Planning and Detailed Measurement for Rail Infrastructure Works', which was published by Network Rail, July 2015. This is the approved rail industry estimating methodology and was devised by Michael Byng himself.

A summary of Michael Byng's latest estimate of costs is provided in Table 3.3. The total of £107.92 bn. represents a modest increase on his previous estimate from earlier in 2019 of £106.54 bn.

Table 3.3 Michael Byng's estimate of costs

Event	Phase One (£bn)	Phase 2a (£bn)	Phase 2b West (£bn)	Phase 2b East (£bn)	Total (HS2 Project) (£bn)
Base Cost	51.27	5.61	20.01	21.88	98.77
Risk allowance	3.20	0.99	2.22	2.74	9.15
Total	54.47	6.60	22.23	24.62	107.92

Note: All figures are based on Q1 2015 prices

The above total does not include the cost of rolling stock, which Michael Byng estimates would add another £7.9 bn. and take the total to approximately £115.8 bn.

Another important factor to consider is the fact that, once built, the HS2 railway will not be well-connected to the rest of transport network, especially from some of the key city stations that it will serve. It has been estimated by Sir John Armitt, Chairman of the National

Infrastructure Commission that the Government would need to spend another £43 bn. to achieve a fully integrated network.⁶

This is discussed further in paragraph 6.

The other question is inflation. With the above cost estimates based on 2015 prices, and the project programme now extended by up to seven years, the cost of inflation will be hugely significant and needs to be accurately calculated.

3.5 Summary of cost estimates

	Year of prices	Phase 1	Phase 2A	Phase 2B	Total
Feb 2011	2009				32.00 ⁷
SR 2013 long term funding env	2013	17.6 target			50.10
Outline ¹¹ Business case October 2013	2011	19.4	19.0 2A and B		45.3 incl 6.9 RStock
July 2015 Spending Review ¹²	2015	27.18	3.72	24.83	55.70
2016 Funding Envelope	2016				57.00
April 2017	2016	18.80			
Chairman's Stock Take	2019	38.50	3.60	24.00	88.00
mbpc Estimate	2017	54.90	8.02	45.00	107.92

⁶ <http://www.infrastructure-intelligence.com/article/aug-2018/sir-john-armitt-urges-ministers-spend-extra-%C2%A343bn-%E2%80%9Cmake-most%E2%80%9D-hs2>

⁷ Excluded is rolling stock, estimated by HS2 LTD.at £1.826bn.

¹¹ Outline Business Case with P50 confidence and Long Term Funding Envelope

¹² High Speed Two Phase 2 Financial Case July 2017; long term funding envelope for whole project; funding allowances for individual phases

4. Review of cost and programme estimates

4.1 Phase One: Euston to West Midlands

It has long been acknowledged that Phase One represents the most complex and expensive of the phases, not least because it includes the heavily urbanised approach into one of the busiest railway stations in the country, but also because of the amount of tunnelling to be carried out and being in the most expensive part of the country to acquire land.

As a result of the Chairman's Stocktake the admitted costs of Phase One have potentially risen by more than 40%. This has been largely driven by the fact that HS2 Ltd. has included a 24-32% contingency into its costings. However, this is a very worrying development given the length of time that this phase of the project has been in gestation. Indeed, Phase One received Royal Assent in February 2017 and therefore one would expect the costs to be well-developed by now, especially since the main works contractors have been working on the detailed design for over two years.

Despite this, in its presentations to the Review Panel, an HS2 Ltd. representative stated *"...that the revised Baseline 7 estimate for Phase One is not yet complete and that greater precision depends critically on progress with the current civil works contractors whose risk appetite is low"*.

It is clear from this statement that HS2 Ltd does not have a reliable estimate of its own, but is instead relying, rather forlornly perhaps, that its supply chain will somehow manage to keep its estimated costs low, despite the risks they are being asked to accept. Such an approach is not sustainable as the realistic costs of undertaking the work will ultimately have to be absorbed by the project.

I therefore consider that Michael Byng's RMM based costs more accurately reflect the likely final out-turn costs for Phase 1. At nearly £54.5 bn., these are just over double the size of the SR2015 funding envelope of £27.2 bn. and would add another £17.1 bn. to the worst-case (£38.4 bn.) outlined by HS2 Ltd. in the Chairman's Stocktake.

4.2 Phase 2a: West Midlands to Crewe

Although the shortest section of the HS2 project, and by far the cheapest, Phase 2a is not without its complications.

It is also interesting to note that HS2 Ltd. has barely changed its cost estimates since the 2015 spending review, especially when compared to other parts of the route. However, Michael Byng does not agree and considers that the current £3.7 bn. budget and maximum of £4 bn. now allowed for in the Chairman's Stocktake are simply inadequate and that the Phase 2a costs would be £6.6 bn.

As part of his assessment, Michael Byng is acutely aware of the work that has been undertaken by his client the Stone Railhead Crisis Group (SRCG's) on behalf of three parish councils located in the Stone area of Staffordshire. He has therefore undertaken a detailed costing exercise of the construction of the Stone Railhead and subsequent Infrastructure Maintenance Base-Rail (IMB-R) and undertaken a similar exercise in respect of the SRCG's proposed alternative Railhead/IMB-R site at Alderley's Rough, located approximately 13km to the north near Keele Services.

Michael Byng has identified significant problems with the feasibility of HS2 Ltd.'s construction proposals for the Stone site and has estimated that if HS2 Ltd. does attempt to construct the Railhead/IMB-R it risks delaying the construction period of Phase 2a, which

was originally 4 years, but extended by 6-12 months with the latest round of '*Additional Provisioning*', by potentially two years or more.

Michael Byng has also estimated that building a Railhead/IMB-R at Stone will cost over £70 million more than at Aldersey's Rough and result in a far inferior maintenance facility for both Phase 2a and 2b (West).

He is also aware that the petitioners have made these points to the Phase 2a Select Committee, having given evidence on three occasions. However, their concerns and technical evidence were dismissed on the basis of what the petitioners believe was misleading evidence given by HS2 Ltd.

4.3 Phase 2b

The estimate of costs and schedule for Phase 2b is least mature. If Phase 2B proceeds as currently planned, the cost estimate will need to be revised: there are likely to be further cost pressures including in respect of property costs.

4.4 Scrutiny of costs

The Panel attempted to review the development of the estimated cost of the project from information published by HS2 Ltd.

It was impossible for the Review Panel to either challenge or interrogate these figures due to the inability of HS2 Ltd. to provide a structured estimate for examination. The Review Panel asked the DfT officials supporting it, to instruct HS2 Ltd. to disclose this information, however they were not able to do so, thus frustrating one of the principle tasks of the Panel, to challenge HS2 Ltd.'s cost estimates.

However, there is growing evidence from 'Whistle-blowers' that a figure of at least £84 - 86 bn was accepted within HS2 Ltd.'s higher management in the Autumn/Winter 2016, and there are reports that, at a conference held at the Saïd Business School at Oxford at the same time, attended by officials from HM Treasury, the Department for Transport and HS2 Ltd. directors, there was discussion that the ultimate costs at 4th Quarter 2015 prices could be as high as £100 bn.

Given the uncertainties and questions over HS2's cost estimates going back several years, it was very useful to receive an independent assessment of HS2's costs from Michael Byng, who had been following and monitoring HS2's costs since supporting the petition by Sam Price to the Lords Select Committee in connection with alternative designs for Euston station in 2016.

Unfortunately, it took four weeks of the Review period to obtain more details of the HS2 Ltd. costs and the methodology they used and, only towards the end of October was a directly comparable assessment made, led by KPMG. Even then, DfT appeared reluctant to release any but the most high-level costs from HS2 Ltd., citing commercial confidentiality, but this only continued a policy that ministers have adopted for several years - that they do not recognise Michael Byng's estimates, but have no alternative to offer. For a government-funded project costing some £100bn, this lack of transparency is unacceptable.

In its presentations to the Panel, HS2 Ltd. has stated "*that the revised baseline 7 estimate for Phase 1 is not yet complete and that greater precision depends critically on progress with the current civil works contractors whose risk appetite is low*".

There is unsurprisingly a greater degree of certainty on Phase 1 costs (excluding the cost of the Phase 1 stations). There is apparently still a 24-32% contingency in Phase 1, which

implies fairly low certainty, but any reduction in contingency would probably be balanced by an increase in construction costs. Three points should raise concern.

The uncertainty of costs on the Phase 1 contracts, is, I believe, highlighted by a statement made HS2 Ltd. at the Costs Roundtable meeting held on 2nd October 2019; HS2 Ltd. apologising for a further increase in the amounts of professional fees paid to date, said that it would recover the additional costs from the supply chain in the contract negotiation process. It is difficult to reconcile this statement with the earlier statement made about the contractors' approach to risk.

The procurement strategy described by HS2 Ltd at the same meeting also gives cause for concern. The presentation made by HS2 Ltd. suggested the "a target cost" not a lump sum contracting strategy would be used in placing contracts. As target cost contracting removes much of the risk from the contractor, it is difficult to accept that cost certainty will be achieved by HS2 Ltd. using this strategy. The contractors have limited incentive to meet the targets, whilst professional fees to cover the cost of managing the contract, will continue to rise.

The redevelopment of London Euston Station presents challenges and uncertainties both in terms of schedule for delivery and cost. There are opportunities to re-think or re-design Euston so that cost savings can be achieved with the limit of 14 trains per hour – such savings would impact on train frequency which would in turn affect the BCR but are necessary as 18 tph is not deliverable.

In the absence of a robust completed estimate for Phase 1, which can be used as a basis for the estimates of cost for the remaining Phases, 2a, 2b (East) and 2b (West), these estimates require further scrutiny. Similarly, it was not clear to the Panel that there has been a full read across of costs from Phase 1 of the project to the remaining phases or whether assumed efficiencies are achievable.

However, costs could be saved for all Phases by redesigning for lower speed and TGV type alignments, as suggested in paragraph 6.

4.5 Costs of cancellation

In the event that the Project is cancelled there are costs, presently attributed to it, which could be saved, or the work used for other schemes. The savings include:

- oversite deck at London Euston station,
- subsurface access to Crossrail 2 Station,
- improved subsurface access to Euston Square Station,
- demolition of the downside carriage shed to provide new platforms for an enlarged station within its existing footprint,
- reuse of the site of Birmingham Curzon Station to form additional West Midlands station capacity for inter-regional and commuting services, and
- sale of land acquired for the construction of the project, currently vested in the Department for Transport, to recover expenditure.

The list is not exhaustive. There are some costs of closing down the project which might be mitigated by the allocation of the alternative schemes, listed in paragraph 6, to the contractors already engaged on the project.

The nett cost saving based on the adoption of the schemes outlined in Appendix 3.1 - HS2 Recovery and Replacement Works is £5.5 bn, mainly and Euston and Birmingham Curzon St.

4.6 History of HS2 Ltd.'s costs

The present HS2 Ltd. cost estimate summary from the Chairman's Stocktake gives an outline of the company's present estimate to completion of all phases. There are a number of unanswered questions about the method of measurement used by HS2 Ltd. including the apparent non-existence of a structured estimate in the form in daily use within Network Rail, and whether the Department of Transport's regular statements that 'the funding envelope would not exceed £55.7bn' gave the full story.

The original 'Estimate of Expenditure dated 15 November 2013 produced as part of the documents to accompany the Bill for Phase 1 gave a total of £19.39bn for Phase 1. This excluded rolling stock and was based on 2011 Q2 prices, with an estimated contingency at a confidence level of P50. An Outline Business Case was also published at the same time and it was on the basis of these and other documents that Parliament gave the go ahead for the Phase 1 Bill. I am not aware that Parliament was informed of any revision to these figures during the passage of the Bill, so Royal Assent was effectively given on the basis of these figures.

There is growing evidence from 'Whistle-blowers' that a figure of at least £84 - 86 bn was accepted within HS2 Ltd. higher management in the autumn/winter 2016, and there are reports that, at a conference held at the Said Business School at Oxford at the same time, attended by officials from HM Treasury, the Department for Transport and HS2 Ltd. directors, there was discussion that the ultimate costs at 4th Quarter 2015 prices could be as high as £100 bn.

Allan Cook's 2019 Stocktake noted that the previous estimate of £27.2bn to £26.9bn from the 2015 Spending Round Funding Envelope was to increase to £36.1 to £38.4 bn. Elsewhere, I comment on the lack of transparency of the cost estimates over this 6 year period, but here we note that, compared with the 2013 estimate of expenditure, the 2016 Funding Envelope shows an increase of up to 39% and, compared to the 2019 Stocktake, an increase of up to 52%.

I do not believe that even these higher costs quoted in the Stocktake are necessarily realistic. For Phase 1, there remains uncertainty around the final design, the contractual risks and the uncertainty of the design and costs of the approaches to Euston station and the station itself. The Stocktake gives a number of reasons for this increase, including lack of geological information, but this does not excuse the very significant increase compared to the figure on which Parliament gave its approval. Given the amount of good geological information available about the UK, I do not find this excuse very credible.

HS2 Ltd. also appears to be uncertain as to whether it has used the standard methods of measurement for the rail sector, the RMM suite, so that all the various parties to the project could be sure that they were working to the same methodology. For example, at a meeting between Lord Berkeley and Transport Minister Lord Ahmad of Wimbledon, attended by DfT and HS2 Ltd. (Michael Hurn of DfT and John Stretch of HS2) to discuss the estimated costs of HS2 Phase 1, Mr Stretch produced a spreadsheet summary of costs for Phase 1, which was in RMM format, the rail industry standard. Later, during the Review meeting on Wednesday 2nd October 2019, Stephen Blakey of Network Rail confirmed the RMM suite was in regular use within HS2 Ltd. as it is within Network Rail. However, HS2's Tim Smart, giving evidence before the Select Committee in the House of Commons 23rd April 2018, stated that quantities were derived from a 'Cost Model' and were incapable of being broken down into sections for comparison.

Given the delays and difficulties the Review team have had in obtaining information from HS2 Ltd. on costs, it may be that Mr Smart was correct. In this case, I note that the statement of expenses, originally posted on the Department for Transport website but since withdrawn, listed approximately £447m of payments to consultants to 31st December 2018, of which it appears that £11.40m was paid for quantity surveying or cost engineering advice. Surely for that amount of expenditure, HS2 Ltd. must have a structured estimate, based on the RMM Suite for the railway industry, which sets out in more detail the costs at each stage of the project's development, concluding with the contents of Allan Cook's Stocktake Report? If so, the Review was not given it, despite many requests.

Michael Byng's cost estimate was derived from work undertaken in 2016 to support the petition of Sam Price⁸ to in favour of a smaller and cheaper station at Euston integrated with the Network Rail station and buildable within the width of the existing station; it has been refined and expanded ever since. It was developed from the measurement and valuation work necessary to provide Expert Witness services to other clients (31 Nr) along the line of route of the project; this additional valuation work covers most of the work disciplines required for the project and their costs, as included, in the overall budget/estimate of cost.

4.7. Cost of disruption to rail users during construction

Disruption inevitably occurs when works are undertaken on the railways, although careful design and planning can mitigate these effects. The construction of bridges, cuttings, embankments and underpasses etc are likely to bring severe disruption to parts of the motorway network, particularly in the West Midlands. There may be some prolonged disruption of some rail lines during construction of HS2 as well as risks of severe disruption if there are construction problems. For example, at Euston, one option is to build HS2 tracks in tunnels and crossovers under the main six track Network Rail approach to Euston station. This is an unnecessarily risky option.

Severe disruption may occur to GW trains into Paddington during the construction of Old Oak Common station.

HS2 Ltd. argues that such disruption is inevitable, but there is evidence that not enough effort has been put in by HS2 Ltd. to discuss options and accept alternatives that could minimise disruption.

HS2 Ltd. also argues that its construction causes less disruption than upgrading existing lines. On its performance to date, this is questionable.

4.8 International comparators

There is interest in whether the HS2 Ltd. cost estimates are comparable to high speed rail lines in other countries and to other UK projects.

Independent benchmarking commissioned by the Department of Transport indicates that:

- the cost of HS2 is substantially higher than the cost of high-speed rail lines in other countries. Differences in cost can be explained by UK factors but most importantly the different and very high specifications to which HS2 is being built, and
- the current HS2 Phase 1 cost estimates are comparable with, though at the upper end, of the costs of other UK infrastructure projects;

⁸ Petition HoL-00691, heard 11th October 2016

From the information provided to the Panel, the comparators considered applied only to the capital cost of the project and not to the effect on rail usage caused by the introduction of a major new rail system. Without the type of comparison, the assessment of benefits cannot be adequately completed.

I conclude that HS2 Ltd. have been designed and built at a significantly lower cost if the original specification had been changed to the one broadly equivalent to that used for HS1, using technical standards (TSI) as applied to French TGV lines or similar. The opportunity for change now is limited on Phase 1, due to the limits of deviation and other commitments in the Bill, but for Phase 2B the cost reductions could be significant if changes are made to the design specifications now.

5. Benefits and Value for Money

5.1 Introduction

It was not possible to obtain, in the time available for the review and with the difficulties put in the way of the Review, full independent advice. One source was only asked to comment on HS2's completed work on reducing frequency, which considered the removal of the Hansacre link. However, it appears that HS2 Ltd. has followed all of the DfT guidance on benefits for schemes that have minor impact; e.g. a road bypass or a new connection on an existing railway.

However, their analysis does not reflect the actual demand for these services, which may result in major changes to rail usage. The analysis does not define whether the scheme is for speed or for capacity nor does it truly consider what, if any, are the overcrowding or capacity issues on the WCML that HS2 is designed to solve.

The Review was told that the HS2 scheme is to reduce congestion south of Rugby, but there was no evidence of the demand being modelled separately for Phases 1, 2a or 2b East or West.

It appears that HS2 demand was based on Inter-City growth over the past two decades, projected forward to the end of construction period, with the assumption that all extra growth will transfer to HS2.

The West Coast Main Line would be assessed for future use and demand, but the Review were not able to meet the West Coast Partnership, so that any usage switching pattern would be based on existing usage - travel patterns based on marginal changes rather than on a major new railway.

5.2 The misleading Benefit Cost Ratios

The BCR was mentioned in the 2013 Bill documents, and in 2017 was quoted by the DfT as 2.3. With the cost and time increases in the 2019 Chairman's Stocktake this reduced to 1.3. Based on the cost estimate of £107 bn and 14 trains per hour maximum, the HS2 project now has a BCR of less than 1 – see Table 5.1.

An independent assessment of BCR suggests that it should be further discounted to reflect the fact that most of HS2 capacity will be absorbed by commuting from the Midlands to London and not used for high-speed inter-city traffic.

More work needs to be done on the benefits to reflect the above changes, but it is clear that the BCR could fall to 0.6:1. and therefore rank 'poor value for money' when using the Treasury Green Book. This means that the taxpayer would receive only 60p of return for every pound that is spent on the project, which is clearly a poor investment return.

Table 5.1 Benefit Cost Ratio summary

	2017 Economic Case	Increased capital cost	Reduced train frequency
Net Transport benefits £bn	74.6	74.6	58.6
WEIs £bn	17.6	17.6	13.8
Net benefits including WEIs £bn	92.2	92.2	72.4
Capital costs £bn	55.8	111.0	100.2
Operating costs £bn	27.6	27.6	19.7
Revenues £bn	43.6	43.6	30.6
Net costs £bn	39.8	95.0	89.2
BCR excl. WEIs	1.87	0.79	0.66
BCR incl. WEIs	2.32	0.97	0.81

Note: In the table above, blue indicates numbers from the 2017 Economic Case. Red indicates numbers updated based on new evidence. Some of the figures vary slightly from those quoted elsewhere in this Report but the general trend is not altered.

WEI = Wider Economic Impacts,

Source HS2 data and others.

How has all this come about? Apart from a wildly optimistic cost estimate in 2013, one must look at the forecast revenue – from tickets. The forecasts are all done with the DfT model, and it is difficult to challenge the figures both in respect of the number of passenger and the fares charged. For example, with each train planned to carry over 1,000 passengers, one might query whether 3,000 passengers and hour will actually want to travel between Birmingham and London or Manchester and London.

Secondly, will the fares be the same as on existing lines? Many high-speed lines on the continent charge a premium, although our ministers have denied that any premium is planned.

However, the greatest challenge to the revenue is that HS2 Ltd. plans to operate 18 train per hour. My investigation and evidence from HS2 Ltd. indicate that no high-speed line in the world operate at more than 14 tph except for one in Japan which runs 15 at peak hours. This information is confirmed by evidence given on 21 June 2011 by Pierre Messulam, Strategy Director of SNCF, to the House of Commons Transport Committee Inquiry into High Speed Rail when, in answer to a question from Steve Barker MP: 'But is there anywhere on the network that operates at 18 train paths per hour?' Pierre Messulam: replied 'On a high-

speed line, nowhere in the world. The Japanese are running 12 trains per hour. We are running a maximum of 12 trains per hour. We are considering next December 13 trains per hour, and nobody does more.' Little has changed since then; the hoped-for introduction of ERTMS signalling, on SNCF lines and the UK's West Coast Main Line, has not materialised, and there is every indication that it will not provide any additional capacity for a long time.

So why did HS2 Ltd. not take the advice of SNCF rather than insist that the business case for HS2 be based on an unachievable operating timetable of 18 trains per hour and therefore unachievable fare revenue?

For the present HS2 Review, I suggest 14tph as an achievable number in 10 years' time rather than the 18 used by HS2.

Thus, it appears that HS2's business case was improved by adding more trains and therefore more revenue. Unfortunately, it is not possible to calculate the amount of any change in business case without having a new timetable of destinations and therefore passenger numbers. This of course in turn means that promises made by HS2 Ltd. and ministers to different cities about their HS2 services will have to be redone to leave out 4 trains every hour. This will be a challenge for ministers, but it is more important to tell the truth now rather than in five- or ten-years' time.

More generally, one must wonder whether the whole edifice of construction costs, benefits and the resulting Benefit Cost Ratio was not created as a device to obtain parliamentary approval of the HS2 scheme. After all, the Department for Transport has control of forecast passenger numbers which, because of the franchise process, are commercially confidential.

The Department for Transport recently changed the appraisal methodology so that there is a greater benefit from faster and longer distance journeys compared to commuting, despite much evidence that higher speed for intercity travel is less important now that people can work more effectively on trains. Was this done to help HS2?

So HS2 Ltd. and ministers started with a low-cost estimate of £13bn with no opportunity for parliament to scrutinise the detail and continued to keep the true costs from parliament until it is almost too late to stop the project, even though the capital cost is now over £100bn and a BCR possibly as low 0.6 and therefore ranks poor value for money when using the Treasury Green Book.

5.3 Rebalancing the economy

The stated objective of HS2 is to help rebalance the economy and drive economic growth in the Midlands and North through improved rail connectivity. The NPH and MC both state that HS2 will bring significant benefits and economic growth to their regions and quote some major companies who have already decided to set up in these areas, even if it will be some 20 year before HS2 arrives. Sir Terry Morgan, a previous Chair of HS2 Ltd., claimed at a conference in November 2018 that 'existing local growth plans show it (HS2) could help create almost 500,000 jobs.' Where is the evidence for this figure? Would alternative rail investments, for example on commuter lines in the NPH and MC areas, achieve the same figure? And were the new jobs created or sucked in?

Where is the evidence that these companies would have come anyway for other reasons, for example a plentiful supply of workforce or lower wage rates, and also whether the benefits of improved regional transport, either provided by parts of the HS2 line or other improved lines, would have a similar effect?

I also note that HS2's own business case suggests that 43% of benefits go to London and the South East. So, will HS2 attract more people to commute from Birmingham to London or vice versa? The alternative of an electrified Chiltern Line from Euston via Old Oak Common to Birmingham provides far greater relief for commuters. Would other interventions do more to rebalance the economy in favour of the midlands and North?

However, I have not seen any work to show how the released capacity North of Rugby could benefit commuters.

The evidence to support the argument that high-speed rail brings economic growth is, again, mixed. In the UK, one can point to Canary Wharf's success and contributing to funding quite small parts of the stations, but neither Ebbsfleet nor Ashford have benefited much from HS1 being build 20 years ago.

So, if the effect of HS2 in rebalancing the economy in these areas is uncertain, what other measures are likely to be needed to make this growth happen? For example, improved intra-city and intra-regional connectivity could be a priority to help movements and commuting within these areas, as well as taking people out of their cars to a greater extent than intercity trains is likely to do.

The Review also noted that, whereas intercity passengers want a seat, other comforts etc but do not generally mind being a few minutes late when they travel once or twice a week, and do not need frequency to the same extent, commuters have different needs; a seat, reliability and frequency and overall journey time. The volume of commuters is much greater than intercity passengers, but they do not pay so much. So, the business case for commuter enhancements may be lower than for intercity travel, but the number of beneficiaries greater. On this basis, many of the HS2 Phase 2 tracks within the NPH area should become higher speed commuter lines, providing the fast pair of tracks to parallel the stopping services and integrated with the regional services.

Finally, there has been much talk about attracting Foreign Direct Investment, but I have seen little concrete evidence of this, or whether similar amounts of investment would come from improved local and regional services rather than a high-speed line with an exciting title.

There are clearly opportunities for economic development around stations, but such investment does not have a direct effect on the basic BCR, and such investment does not generally fund the railway station itself. There is evident interest in developments at Euston, Old Oak Common and stations in the Midlands and North. I heard evidence from Birmingham and other places that HS2 is already having a tangible impact, even at a planning stage. However, it is surely difficult to claim without better evidence that such investment is due to HS2 rather than other regional and local rail improvements which would benefit the workforce of the region more. There is a strong body of opinion in the Birmingham/West Midlands Region that its economic growth since 2016 has been driven by the strength of automotive and aerospace industries and not by any proposed improved connectivity to London so the claims made for the HS2 project are open to challenge.

I conclude that economic regeneration around stations will come as much from improved local and regional rail services as oppose to those which enable faster journeys to or from London. Indeed, there is a risk that HS2 is detrimental to these regions, simply drawing more people into London and the South East.

5.4 Capacity

The original intent for HS2 was to provide a very high-speed link between London and the North; a few years later the need was changed to providing more capacity to relieve the West Coast Main Line and other North-South lines. There is reported to be much support for more capacity on the main lines out of London, and there may be certain constraints to growth. There are also reports of shortage of capacity on regional and commuter lines in the NPH and MC areas which also constrain growth.

However, it is important to distinguish between the demand for more train paths and the demand for more seats, and where the additional seats are most needed. On the West Coast Main Line, such evidence that it has been possible to obtain from the Department for Transport indicates that the greatest demand for seats is in the longer distance commuter areas, Milton Keynes to London and Crewe to Manchester. In between, there is often spare capacity, even at peak times. However, is there not an equal or greater demand for improved services into London from South of the Thames? Capacity is also required for freight trains; the latest DfT rail freight forecasts indicate a demand for around 6 freight trains an hour per direction on parts of the WCML North of Nuneaton, but perhaps these can balance the reduction of train numbers turning off from the Euston end to Birmingham (see paragraph 6).

There are opportunities in the WCML to undertake smaller enhancements to complete the four tracking, to introduce grade separation where needed and of course to lengthen trains. Chris Stokes and others advised that further growth in passenger numbers could be achieved by making changes to the timetable. In all, these could provide 25% or more additional seats.

Similar capacity improvements can be made on the Midland and East Coast Main Lines, all described in paragraph 6.

It may be that there is a shortage of train paths, as indicated by passenger train operators requesting more paths in the hope of attracting more passengers or, where there is competition, keeping other operators away. This is a problem with the current regulatory regime and, for freight, by the ORR failing to require Network Rail to reserve so many freight paths an hour, even if they are not always used (see paragraph 2.10).

5.5 Service quality and ways to utilise capacity

Punctuality and reliability of trains on the West Coast Main Line and other main lines varies but has generally improved over the years. Clearly a new high-speed line with modern equipment and infrastructure would be expected to perform more reliably than the classic network, but the extent to which this is so important for intercity customers is debateable.

There is also evidence that, whereas long distance travel demand is levelling off, demand for long distance commuting continues to grow. The causes are thought to include newer technology allowing home working on some days, teleconferencing and the effect of house prices. Again, there is likely to be a difference in this effect between commuters and long-distance passengers.

It is necessary to compare the commuting demand and flows between the London area, the Midlands and the Northern Powerhouse areas. Whereas London has generally an excellent commuter service with modern longer trains, in the Midlands and North the commuting experience is very much worse, with short trains, slow trains, infrequent trains and a general

trend to commute by car. Giving these areas better local and regional rail services will significantly help the economy there as well as reduce the carbon dependence.

The extent to which HS2 helps improve this local and regional commuting varies; Crewe to Manchester, Sheffield to Leeds, Birmingham Interchange to Birmingham Curzon Street as well as longer commutes such as Birmingham to Manchester or Leeds or Toton are all likely to grow the market but we have to consider whether HS2 is the best way of achieving these necessary improvements. There is also a timing problem for some routes; for example, the Crewe to Manchester HS2 route will take at least 10 years to complete; it is hoped that NPH can agree on some interim arrangements to provide more capacity before the HS2 2b west leg is open.

HS2 services are planned to extend beyond the Northern ends; to Liverpool, Glasgow and Edinburgh. The speed improvement to the longer services are not as great as might be expected, as the planned HS2 trains do not tilt, so will be slower on the more curvaceous parts of the existing lines. There is also concern that the addition of HS2 trains will significantly reduce the number of freight trains paths on these routes. Clearly further work is required to come up with a timetable that works for all users. Any enhancements beyond the existing HS2 scope are for others to propose and agree.

There are alternatives to HS2 in capacity terms, by upgrading existing lines. These are discussed in paragraph 6, 'options'.

Finally, HS2 as now planned is mainly designed for intercity flows; such services which currently run on the main lines are likely to be transferred to HS2, so that cities such as Coventry, Stoke on Trent etc are in danger of losing the capacity and frequency of the existing intercity WCML services.

5.6 Connectivity

The stated strategic objective of HS2 is to improve connectivity. However, whereas there may be improved connectivity at the stations which HS2 serves, it is debateable whether their current design provides the optimum connectivity to other services, be they rail, tram or bus, or whether there are alternatives that would improve connectivity at a lower cost.

Large journey time reductions between cities and London on HS2 only apply to those cities served by HS2, and not others, such as Nottingham, Derby, and to some extent Birmingham because of poor locations of HS2 Ltd. stations. The London to Birmingham journey time gain will be at least partially eliminated by a less convenient location of Curzon Street, and London to Nottingham and Derby journey time gains will be almost completely eliminated by need for lengthy bus or tram transfers. I do not know what proportions of London-Birmingham passengers make connections to local services at Birmingham and will need to change stations or continue to Wolverhampton on the Pendolinos.

Even the London terminus at Euston is sub-optimal, being significantly less well connected than Kings Cross/St Pancras, and dependent on the construction of Crossrail 2.

Is there the potential for unlocking new rail travel markets where currently rail journeys are so poor that people drive or don't travel? Is this more important for long distance travel or commuting/local services? There is a risk that regional transport investment is distorted by HS2. These plans need to be rewritten as necessary to redress the HS2 connectivity deficiencies and fully integrated with regional transport plans.

Panel Member Prof Stephen Glaister has commented:

It is relatively easy to work out an objective account of how and to what degree a railway scheme will improve connectivity between places. No doubt, better connectivity will offer benefits to some people.

But that begs the harder question of how many people will benefit and by how much, and whether that justifies the cost of the connection.

One view (as in the “gravity model”) is “connect them up and they will use it”. Another (cynical economist’s) view is that one reason that places are not already connected is that historically not enough people wanted to make that specific trip to justify the cost of the connection.

That’s where a proper analysis of labour markets, geography and shifting industrial structure to give a benefit-cost estimate helps to sort things out. The Wider Economic Benefits calculation in the standard appraisal is a nod in the direction of accounting for this.

This was one of two fundamental difficulties with the controversial KPMG analysis of HS2’s benefits. They attempted a cross section study of the relationship of productivity of places to their level of connectivity. Good idea in principle. But there was no way to be sure whether a place has high connectivity because it is well connected; or a place has good connections because it has high productivity. You need to know which it is to draw conclusions about the benefits of improving connectivity.

Low productivity is certainly a problem and ability to travel to labour markets is certainly an issue. But where is the evidence that spending a great deal of public funds to improve connectivity sometime after 2040 is a better way to tackle the problem than improving education and training in relevant skills, and bus services, in the near future? “But there was no way to be sure whether a place has high PRODUCTIVITY because it is well connected; or a place has good connections because it has high productivity”

In short, listing out how much better places will be connected by transport links is only half a story.

Sadly, there was not time during the Review to look into these issues further.

5.7 Conclusion

An integrated rail transport strategy needs to be developed. HS2 was developed before NPH and MC. There is a need to reconsider Phase 2b in the light of NPR and MC plans to ensure that the right places are being served in the right way. Phase 1 must be integrated into the strategy too. Intercity connectivity is important, but so too is regional and commuter connectivity. HS2 clearly delivers inter-city improvements, but also frees capacity in some locations (Birmingham to Rugby, Manchester to Crewe) for regional and commuter services to be improved, but I must ask - is it the most cost-effective means of achieving this?

Traditional Value for Money appraisals for HS2 do not work; government needs to make a choice on whether it believes wider economic benefits will happen whether a scheme will be value for money or not. Proceeding with the project is not supported by BCR results; it must be a government policy decision whether to build it regardless of other priorities for spending £100bn+ or for spending some of the money on a range of local and regional rail services.

6. Options

Regional rail strategies have been developed some five years after HS2 was planned and must now be retrofitted into HS2 or, preferably, HS2 lines should be redesigned to fit into the NPH and MC touch points. Regional trains must also be able to use the HS2 lines, although not of course at 320 kph! There is merit, however, in adapting the current Inter-City West Coast Pendolino fleet to be able to run on HS2 lines; I understand that the fleet could be upgraded to operate at 140mph (225kph); this is slower than the 320 kph which should be the maximum operating speed of HS2 but, with their tilting capability, timings to Scotland could be significantly improved.

Leaders from NPH and MC areas are clear that they need HS2 as well as intra-region connectivity but, when pressed on what they would prefer if there was not enough funding for both, they generally chose the latter. This is not only because this is more important for their local economy but also because of the considerable delay in HS2 reaching the Midlands and the now confirmed long time it will take for HS2 Phase 2B (East) and 2b (West) to reach the North.

There is a need for the regional and local connectivity and services to be planned in phases with committed funding to give some 'quick wins' before HS2 arrives and for HS2 to be redesigned in some places to fit into the regional network plans. The amount of funding required for these regional and local services in the NPH and MC areas is estimated to be around £39bn – and this is needed to be spent, whatever the options for HS2 are chosen.

6.1 introduction

The Terms of Reference for the Review asks us to examine a number of options for reducing the capital cost, improving the BCR, changing the order of improvements or new construction. These are compared to the 'base case' of continuing with the complete HS2 scheme. I comment on each one where possible in respect of its capital cost, time to develop and benefits, including connectivity and capacity and also of not building any part of HS2 and relying on using and growing the capacity of the conventional railway.

I also comment on the option of starting the construction of HS2 at the Northern end.

Some of these options will deliver growth; some may be less than perfect but may fulfil a local or regional need; we must also be mindful that the Treasury Green Book BCR shows a preference for high-speed long-distance services, whereas the local and regional economy may demonstrate a greater need to prioritise local and commuter services.

Construction works on railways always causes disruption to services. The West Coast Main Line upgrade was particularly painful for passengers and costs, but lessons have been learned and upgrades to existing lines should not be ruled out. Similarly, HS2 construction will affect many lines where they join, not least at Euston and its approaches.

6.2 Consideration of alternative options

The base case is to complete the full HS2 project (Phases 1, 2A and 2B East and West) as specified at a cost of £106bn with opening of the final part of Phase 2B expected by HS2 Ltd. to be in around 2035 to 2040. The Benefit Cost Ratio (BCR) is estimated to be possibly as low as 0.6:1.

Some may ignore this and suggest that, since the economic model is not able to capture a political vision of a rebalanced economy, ministers should proceed with the project as an act of faith rather than on an evidential basis. However, it may be that there are better ways of

achieving the economic benefits claimed by HS2 Ltd. at a lower cost and in a manner that integrates parts of the project more easily with other rail services and enhancements planned or needed in the regions. In the time available, it is not possible to go into much detail, but the Review considered broad concepts including:

- alternative conventional network upgrades,
- reducing sections of planned scheme,
- reducing specification,
- changing the order of building HS2 - northern sections first, and
- cancelling the project altogether.

With all the above, one could consider permanent change or leaving passive provision for the future. See Appendix 3.

For options, I considered, at high level, impacts where possible on:

- costs: I give costs where we can of the relevant parts of the HS2 scheme,
- value for money (costs compared to benefits),
- timescales, and
- deliverability, risk, other factors e.g. supply chain confidence, environment.

6.3 Options for the whole HS2 scheme

The existing HS2 scheme, as currently planned cost £107bn, time for completion 2035 to 2040.

Maximum Speed: The alignment is for 400kph but is being built for 360kph maximum running speed. Mostly trains will run at maximum 330kph, slower on northern sections.

Frequency: the planned 18tph is higher than any other known high-speed line, in Europe or Japan. HS2 Ltd. considers that by the time that Phase 2B comes on stream, there will be better signalling to allow this greater frequency. This same comment was made to justify the WCML upgrades but, ten years later, there is no sign of ERTMS/ECTS coming on stream any time soon. So, I believe that planning, timetabling, cost benefit calculations etc should be done based on a maximum of 14tph. An option might be to make passive provision at stations for more trains, but on other parts of the network it is generally left to the creativity of the railway managers to make the necessary changes to meet demand.

This is effectively the base case, but with the number of trains reduced to 14; the capital cost will not change significantly apart from buying fewer trains, but the BCR will be lower.

On costs, it may be that one should include the cost of the upgrade of Network Rail Euston station, the deck over tracks, and part of Crossrail 2 which is thought by TfL to be an essential contribution to dealing with the additional passenger brought in by HS2. The estimated cost of upgrading Euston Station for Crossrail 2 access, a link to Euston Square Station and the supports for an over site development deck are £1.945 bn.

6.3.1 The whole HS2 scheme with reduced specification.

There was broad agreement from the panel that the specification is too high.

From discussions with rolling stock manufacturers, reducing the speed of the trains to the standard TSI/TGV/HS1 speed of 320 kph maximum will not have a significant effect on the capital cost of the rolling stock, However, it would have an effect on the civil engineering structures, cutting and embankment slopes, ballast or slab track, drainage, power supply,

stations etc. The impacts from changing these depends on whether this would be a permanent reduction or leaving provision in future to run faster/more frequent trains, and whether to revisit route alignments. To maximise cost savings from reducing the specification, these issues would all need to be revisited.

To make significant reductions to Phase 1 within the limits of deviation, the saving would be small – on structures, track design etc. It would be possible to make greater savings by seeking changes to the limits of deviation to reduce the volumes of earthworks etc, but that would at least mean a new set of permissions, probably through a Transport and Works Act application. This might add several years to the project, for a saving of perhaps 10% of the capital cost of Phase 1. The lower the maximum speed, the greater the opportunities to alter the alignment and the greater the cost savings and, to some extent, a reduced environmental damage.

Where one could start from a clean sheet of paper and design to these lower standards, for example on Phase 2B, savings of around 30% could be possible, according to Transport Scotland's paper submitted to the Review.

Given that there is no case for the current specification, from a capacity release perspective, a full re-specification of Phase 1 to either 320kph and/or 140mph should be considered seriously. There would be longer delays, perhaps the need for another Hybrid Bill, but serious cost savings (and negligible impact on 'real' benefits).

Cost savings⁹ 10% on phases 1 and 2A and 30% on 2B, total saving £15.45 bn, so the total project cost, at 1st Quarter 2015 prices, is £92.47 bn.

The redesign and retendering required for these savings to be effective will delay the completion of the project by several years. Even lower speeds will take longer to arrange but will give even greater cost savings.

6.3.2 additional savings could be made at Euston,

By reducing the number and width of platforms and building a simpler and cheaper approach track and tunnel layout with no dive-under. This could also enable a much better integration of the HS2 and Network Rail station and platforms. This was proposed by Sam Price's petition to the Select Committee of the Phase 1 Bill but rejected due to failure to comply with the HS2 Ltd. specification. With a reduced specification as suggested above, this option should be looked at again with Network Rail.

I believe that planning, timetabling, cost benefit calculations etc should be done based on a maximum of 14tph. An option might be to make passive provision at stations for more trains, but on other parts of the network, it is generally left to the creativity of the railway managers to make the necessary changes to meet demand.

However, many people would not be too concerned about taking 4 to 5 minutes longer to London or Birmingham, if that meant a reduction in capital cost such that other more local rail enhancements could be funded instead with funds reallocated.

As noted in previous chapters, there are opportunities for developing Euston station, whether HS2 goes there or not.

⁹ The cost savings will derive from the construction and design costs and not from the Other Development Costs, including land and risk

6.3.3 Terminating at Old Oak Common (OOC)

For Phases 1 and 2A, there is a need for 10 trains per hour, and these can easily be terminated at the six platforms in the present Old Oak Common design. The station would need additional passenger facilities and bridges to the Crossrail platforms, and some alterations to the approach trackwork.

Onward movement of passengers would be by Crossrail and/or GWR trains.

Railway consultant Chris Stokes in his evidence to the House of Lords Economic Affairs Committee stated, 'I judge Crossrail provides sufficient capacity to allow HS2 to terminate at Old Oak Common, particularly given the potential to increase the frequency (of Crossrail trains) to 30 trains per hour' and lengthen them.

The Committee recommended that OOC should be the terminal station for Phases 1 and 2A. It did not consider the needs of 2B.

Some have pointed out that the time taken for passengers to travel to central London from Euston and Old Oak Common, by Northern Line and Crossrail 1 respectively, is very similar and there are good connections on via Crossrail to many parts of London.

Many people who said they preferred to go to Euston were put off by the name Old Oak Common; which was new, unfamiliar and not central. A cheaper way of achieving acceptance of OOC would be to change its name.

There is development potential at both Euston and OOC, but I believe that capital cost and passenger convenience should also be taken into account in any decision.

The cost saving would be £8.25 bn at 4Q 2015 prices, according to the M H Byng evidence to the House of Lords Select Committee on 11th October 2016 - evidence not challenged by HS2 Ltd. in respect of fact, valuation methodology or quantum, nor did HS2 Ltd. offer any evidence of its own. Time delays would be negligible.

To allow for adding Phase 2B with up to 14 tph, another platform or two would be needed. This could be built but at considerably greater cost, and more connections might be needed to other lines such as the Central Line or Willesden Junction to move passengers. Either way, terminating at OOC would mitigate the expected 20-year construction blight with which the Euston area is now threatened.

There is unlikely to be any cost significant saving here; as an alternative to continuing to Euston with Phase 2B, the trains from Phases 1 and 2A could terminate at Old Oak Common and those from Leeds/Sheffield and other cities on the eastern arm of HS2 served by an upgraded ECML and MML.

Without allowing for Phase 2B trains, and with a decision to upgrade the ECML to Leeds instead (including other works elsewhere) the Phase 1 and 2A arrangement for Old Oak Common could be permanent, but the business case for adding in the eastern arm of the HS2 would collapse.

6.3.4 Hansacre.

The purpose of creating Hansacre junction to the West Coast Main Line was to provide a means of HS1 Phase 1 trains to carry on to the North in the absence of Phase 2A. This need is no longer there as Phases 1 and 2A are now planned to open at the same time.

The residual use of this link would be for one train per hour to serve Stafford and Stoke on Trent, but this could be achieved by retaining or improving the current services on the West Coast Main Line. Based on the calculation contained in the independent estimate, the cost saving is £1.78 bn.

6.3.5 Re-phasing/prioritising starting in the North

One could consider building phase 2b (or parts of it, or redesigned) earlier to deliver Northern/Midlands benefits earlier. However, the benefits from HS2 Phase 2B in the North are dependent on these sections getting permissions through a hybrid bill, and it is unlikely that they could be completed before 2035 or later, as stated in the Chairman's stocktake.

To delay other parts of HS2 until after that date would place a very long-term blight on the land and properties affected by Phases 1 and 2A, so the only practical solution to avoid this would be to cancel permanently Phases 1 and 2A.

Of course, the timing of the start of Phase 2B does not much help providing early rail improvements to the NPH and MC areas which are currently designed around HS2. Some mitigation could be to start Phase 2B West with a short bill perhaps to be deposited on 2020 or 2021 after some small redesign of parts of it to integrate better with NPH rail. There may need to be a delay to Manchester and Leeds station for longer to reach agreement on design and possible through running.

Phase 2B East within the NPH area could take a little more time for an integrated solution to be agreed, so perhaps the 2B East Bill would start a year later than the west one.

In the meantime, work with NR and NPH to provide early improvements to the services - longer and better trains, improvements to the track and platforms that NR could do, given the funding, must be progressed. A commitment from Government to expedite these improvements would be an essential part of the rail improvement packages for this area.

In the Midlands, the problem is greater. It is not possible to use the Phase 1 link from Birmingham Interchange to Curzon St without building the remainder of Phase 1, which continues the blight problem of Phase 1.

So, I conclude that, apart from the sections of 2B within the NPH area, starting HS2 in the North is no longer feasible at this stage of the project on account of the unacceptable blight that perhaps 10 years delay would cause to Phase 1 areas.

Improvements can come from improving the existing rail infrastructure, as described below.

6.4 Cancel most of HS2 and upgrade existing infrastructure

The alternatives to HS2 could include the following routes. In some instances, they provide benefits to passengers from destinations well away from HS2 routes; in others, the link with local and regional services in the NPH or MC areas which would have to be funded from other sources. There are timing and disruption issues that would need to be addressed, but the routes listed could, with enhancements such as these, provide a useful increase in passenger capacity and some speed improvement, but sometimes less than that provided by HS2, but at a significantly reduced cost. In the meantime, existing commuter services into Birmingham, Leeds and Manchester could be extended from three or four cars (sometimes less) to 8 cars, if necessary, by lengthening platforms or selective door openings.

Starting in the North, on both the ECML and WCML there are proposed interventions that would improve the capacity of the lines and some speed improvements as well.

In any event, as suggested elsewhere, there is a need for NR and HS2 Ltd. with the DfT and Transport Scotland to come up with a better integrated timetable on the routes to Scotland including allowing for growth in freight traffic.

Some suggested interventions are listed on Appendix 3.

6.4.1 Within the NPH area, with no HS2 there is still a need for additional capacity on the routes of HS2. Whether these are provided by four-tracking existing two track railway or a new alignment, the purpose is the same – to allow faster trains to overtake slower ones where there is sufficient demand for capacity or speed.

Routes which fall into these categories include the HS2 lines to the West and Manchester; four tracking from Crewe to Manchester and Crewe to Warrington are particularly congested. There are similar congested routes in the Leeds and Sheffield areas. I do not comment further except to suggest that terminating high speed or other lines at buffers, such as proposed by HS2 Ltd. at Manchester, Leeds and Birmingham, is extremely expensive in land and railway terms, and less satisfactory for passengers than providing through services. There must be benefits to revisit these designs as part of integrating HS2 and NPH infrastructure and services to make these termini into through platforms.

6.4.2 Within the MC area, there are no parts of HS2 that could be used in isolation to the rest of the project. So, with no HS2, the most important routes are four tracking Birmingham to Burton on Trent and on to Nottingham and Derby; four tracking Rugby to Birmingham and Birmingham towards Wolverhampton and Stafford. The MML north from Derby and Nottingham needs electrification and four tracking. From Nottingham to Newark with a north facing chord, an upgraded line coupled with upgrading of the ECML would give much improved speed between Birmingham and Leeds and the North. Other improvements proposed in the MC area, including the completion of the Midlands Rail Hub, the development of Moor St and Snow Hill stations with a second through rail route towards Wolverhampton, must also be committed by Government on an urgent basis to replace HS2 Phase 1. Many of these improvements are not technically replacements for HS2 so should be funded by a separate regional transport fund in a similar manner to that proposed for the Northern Powerhouse rail works.

One other route which is also not technically part of an alternative to HS2, since there is no chord at the base of the HS2 'Y', is an upgrade of the line between Crewe/Stoke on Trent and Burton on Trent, as current passenger services on this line to connect Crewe with Nottingham are very bad. This could greatly reduce journey times and also provide an alternative to the WCML for some freight flows.

6.4.3 Routes to and from London.

WCML The work on alternatives tends to focus on the WCML, and whether it is 'full' or not. Network Rail states that 'services loaded in excess of their carrying capacity (as defined by funders) are mostly the outer suburban services currently operated by London North Western Railway'. Similar comment could be made about services between Coventry and Birmingham and Crewe to Manchester. Network Rail and DfT both state that the WCML is full – of trains. Chris Stokes has commented that 'average Virgin West Coast load factors are still only in the 35% band and that 'additional capacity into Euston is not an obvious priority.' He suggest that there are practical, affordable ways of increasing the capacity of the WCML by pricing policy, adjusting the train service, longer trains and train configuration (an increase of 48% on VWC's 9 car sets), demand management, signalling enhancement and infrastructure enhancements, such as building flying junctions, four tracking etc. Upgrades listed by Network Rail in its submission to the Review include

completing the four tracking, building a number of grade separated junctions and some platform alterations. There is work planned at Crewe to facilitate NPH and other traffic but it does not appear to provide for the needs of commuter services to and from Manchester and stations to the west of Crewe.

The Midland Main Line's capacity and speed can be improved by completing electrification and four tracking to increase capacity. It has been suggested that, if more capacity in London is required, one platform at St Pancras could be transferred very easily from Eurostar use.

The East Coast Main Line is in need of upgrade, in capacity and grade separation to provide not only more capacity but increased speed. The main beneficiaries for this could be Leeds and York. In addition, there is a plan to upgrade alternative routes for freight to provide more passenger capacity on the main ECML line.

The Chiltern Line already provides an alternative route to Birmingham. At present, it is slower than the WCML route but could be upgraded and electrified to improve journey times and capacity, by four tracking parts, such as the approaches to Birmingham and London and around Banbury. Marylebone Station is nearing capacity but the line from Northholt Junction to Old Oak Common could be improved to connect with a surface station at Old Oak Common – perhaps a special station for Birmingham passengers?

Consultant Jonathan Roberts estimates that Old Oak Common to Birmingham Moor Street is possible via the Chiltern Line in probably similar time as now on West Coast Main Line, which could release as much capacity on the latter as the two trains per hour forecast as being relieved by HS2. This might need electrification and tilting at 125 mph or non-tilting at 140 mph on an upgraded line. With focus, this is do-able within or sooner than HS2 Phase 1.'

6.4.4 Cost, timescales and disruption

Network Rail and Atkins¹⁰ has estimated the cost of many of these alternative enhancements to HS2 total around £25bn, excluding the Chiltern line. Clearly the work must be spread over a number of years, not only to ease the pain of line possessions but also depending on when the demand for enhancements is identified.

Disruption spread over 13 years on any two of these routes and interventions is estimated by Network Rail at 2,700 weekends, the equivalent to 13 years of disruption every weekend of the year assuming two simultaneous schemes on each route at any one time. HS2 and Network Rail estimate that 223 weekend blockades would be needed on Network Rail lines for the construction of HS2.

Many of these figures come from the 2013 Atkins Report, prepared at a time when Network Rail's ability to cost and deliver projects was at a low ebb, possibly similar to that of HS2. However, Network Rail's new management and structure is well on its way to delivering projects in a more cost effective and timely manner, including reducing significantly the possession times, so these alternatives are only considered at a very high level. Network

¹⁰https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/568309/strategic-alternatives-to-hs2-phase-2b-atkins-report.pdf 'Strategic Alternatives to HS2 Phase 2B' is relevant, and Network Rail's confidential report to the Review gave various interpretations and summaries which are used in this section.

Rail should be asked to take forward a new look at these options but, in the meantime, I believe that they provide a reasonable basis on which ministers can make a decision on HS2.

These options can be refined, but they give some idea of the scale and cost of schemes to upgrade the existing railway as an alternative to HS2. This would provide an ongoing workload for the railway construction industry to mitigate the effect of cancellation of HS2. The supply chain, Railway Industry Association and the Civil Engineering Contractors Association have said that they would welcome more open discussions with DfT, independent of HS2 Ltd. (whose presence they find restrictive), to develop ideas for less onerous possession regimes, thus reducing both cost and passenger disruption.¹¹

6.4.5 Speed and capacity

The Review has noted that, whereas intercity passengers want a seat and other comforts, they do not generally mind being a few minutes late when they travel once or twice a week, and do not need frequency to the same extent. Commuters have different needs; a seat, reliability and frequency and overall journey time. The volume of commuters is much greater than intercity passengers, but they do not pay so much, so the business case for commuter enhancements may be lower than for intercity travel, but the number of beneficiaries greater. On this basis, many of the HS2 Phase 2 tracks within the NPH area should become higher speed commuter lines, providing the fast pair of tracks to parallel the stopping services and freight and integrated with the regional services.

It should be noted that many businesses and politicians in the Midlands and North, when asked whether they would prefer better links to London or improved services within their regions, first answered 'both'. When pressed to give a preference if the funds were not available for both, they said that improved services within their regions would come first, since the services to London were good already, and very much better than most local services, which compared unfavourably with commuter services around London.

Thus, for this option, capacity of the routes listed above is clearly very important. HS2's plan for 14 trains per hour suggests a need to carry some 14,000 passengers an hour at peak, some of whom are diverted from existing services and freeing up capacity for other services on the classic lines.

This demand is only expected to be needed some decades into the future, by which time travel patterns may have drastically changed. However, given the cost and time taken to create or upgrade infrastructure, they do provide a basis for comparison with alternatives.

In the time available for this Review, it has not been possible to go into much detail on these options, but with the improvements to capacity made possible by the Network Rail proposed enhancements spread over the four main lines described, coupled with the use of longer trains, it is suggested that much of this demand could be met with the extra trains needed on the Network Rail lines.

The Network Rail Report states that the above interventions could provide up to 144,700 additional weekday seats to Euston and Kings Cross, 66% of those planned to operate on HS2 Phases 1 and 2. However, this HS2 Ltd. number must be reduced in the ratio 14/18 trains per hour. At 14 trains an hour, the HS2 Ltd. number might reduce to 170,500 weekday seats on HS2, only 15% more than the Network Rail offer.

Journey times - on the Network Rail lines will be longer than on HS2, but with the improvements suggested the differences may not be that great.

Examples

London to Birmingham New Street: 75 minutes by WCML;

similar on an upgraded Chiltern line compared to 49 minutes on HS2 to Curzon St.

London to Leeds: 96 to 99 minutes compared to 82 minutes HS2

London to Manchester: 122 minutes compared to 82 minutes by HS2

6.5 Comparing Options.

Here I compare completing HS2 as planned with cancelling most of it (except in the NPH area) and upgrading NR lines instead.

The cost of the above upgrading NR lines option, of around £25bn plus other lines, such as Chiltern and Crewe to Burton, totals perhaps £30bn. To this must be added the cost of Phase 2B works within the Northern Powerhouse area, say £20bn. Total cost of the alternative to HS1 say £50bn.

The cost of HS2 connections to cities and regional lines as quoted by Sir John Armit as £43bn. Clearly he believes that all of this sum would be needed to bring the full benefit of HS2 LTD.to cities; given that the upgraded NR option will provide some of this, then we can add £43bn to the HS2 costs and 50% of this to the upgraded NR option - £22.5bn.

The time taken to complete these upgrading works is quoted by NR as at least 13 years. Allowing for a start in 2021, this would indicate a completion of 2034 but with many interim improvements before then.

The HS2 completion date, as quoted in the Chairman’s Stocktake, is 2035 to 2040.

To bring the benefits of rail investment to the parts of the UK covered by HS2, there is a clear choice for ministers between building the whole of HS2 or improving the existing lines. Both would require the construction of the parts of HS2 within the NPH area. Both require separate investment in local and regional lines to enable more capacity, connectivity and reduced journey times – for commuters, regional and intercity journeys.

Table 6.1 – comparison between two options

Comparing the two options:	complete HS2 LTD. As planned	Upgrade of NR lines and cancel most of HS2
Completion	2035 to 2040	phased to 2034
Capacity on HS2 or parallel lines to/from London - additional weekday seats	170,500	144,500
Connectivity to local and regional services	limited	better
Weekend possessions on NR lines (total)	223	2,700
Journey times London – Leeds mins	82	96 to 99
Journey times London – Manchester	82	122

HS2 element of cost	£106bn	£50bn
Plus, net cost of cancelling HS2	-	£7bn
Armitt connections to cities – see above	£43bn	£22.5bn
To both of these options must be added the costs of upgrading local and regional services to complement those included above	£39bn	£39bn
Totals	£187bn	£128.5bn

So, the main benefits of the upgrade of NR lines and the cancellation of most of HS2 are that the NPH and MC regions get earlier improvements to their services.

The main disadvantages are in journey time to London and weekend possessions on existing NR lines.

The benefits to Government are that it saves over £50 bn.

Both these options identify some very large sums of taxpayers' money. There needs to be a firm commitment by Government to rail investment in the regions; the difference is that with the upgraded NR option this investment can be done in stages as dictated by demand and finance. For the full HS2 option, by going ahead with Phase 1, the Government is effectively committing to the complete project if there is to be any significant benefit to the regions. For those who do not trust any government to make such a commitment, that is an argument for going ahead with HS2. Only ministers can decide, no doubt helped by public and parliamentary views, whether this is worth the extra £50bn compared to the NR upgrade and including just the parts of HS2 within the NPH area.

6.6 Other options

There are no doubt many other options for saving money and/or reducing the environmental impact of HS2, for example leaving out the eastern arm of the 'Y'. In practice, this would not work without some major changes and several years study. For example, the important link between Birmingham and Nottingham/Derby can either be provided by parts of HS2 Phase 1 and 2B eastern arm or by upgrading the existing line via Burton on Trent but, if Phase 2B eastern arm is cancelled, then there is no connection between the Phase 1 Birmingham arm and the line to Burton. A connection on the HS2 from London, Crewe and Birmingham could be provided, but this would probably require several years study and then a new Hybrid Bill. The costs of upgrades to the MML and ECML would need to be added to this option.

6.7 Delivering the options for the NPH and MC regions

There is much work to do to bring the benefits of improved local and regional services to these regions out with any continuing involvement of HS2. The present arrangements for planning, consulting on and seeing approval for infrastructure changes are long winded and cumbersome, as well as expensive in consultants' time and cost. Having all such decisions made in London also goes against Government policy to devolve such decision making to the regions.

One option to consider is to create structures such as Transport for London in both the above regions, with the new bodies able not only to design and develop changes to rail infrastructure with Network Rail and rail services but also have overall control of fares, timetables, etc and revenue, and include bus services as well. This would enable local accountability with regional political oversight.

A list of possible upgrades to deliver the alternative to HS2 for the NPH, MC and beyond is given in Appendix 3. The total cost of these upgrades is estimated by Michael Byng as £55.3 bn, around half the cost of HS2.

The schemes listed are being developed in conjunction with Network Rail and former railway people; a number are 'shovel ready' and so could be started at an early date to provide some opportunities to the construction industry in place of building HS2.

7. Governance

7.1 Organisation capability & governance.

In the terms of reference, the Review was asked whether HS2 Ltd. is in a position to deliver the project effectively taking into account its performance to date.

The Review has heard substantial and widespread concerns about the performance of HS2 Ltd. This is especially the case in the following areas:

- There is ample evidence, including from the London Borough of Camden, that HS2 Ltd. has also failed to properly address the concerns of local authorities and local people affected by HS2 works.
- On cost estimation & management – costs for the scheme have escalated. Checks and balances within HS2 Ltd. should be improved to help ensure costs are kept under control.
- There is evidence of scope creep and inflation, over-specification and gold-plating (e.g. station design) which needs to be better controlled by HS2 Ltd. and the Department for Transport.
- Geological surveys were done too late in the process – ground conditions have been cited as a reason behind cost increases;
- There was a massive underestimation of budget for land and property purchases,
- There appears to be a lack of technical and construction expertise (including in respect of logistics) in spite of reported payments to a number of senior consultants of over £1,000 per day,
- There is a lack of clarity of the roles and responsibilities in HS2 Ltd, and between HS2 Ltd and the Department for Transport.
- There is a lack of transparency and openness by HS2 Ltd and government departments more generally, and a need to be more transparent and open in their approach, including making sure that Parliament is kept informed about the project's progress.

There appear to have been recent improvements in HS2's governance. The current Chair and CEO are reported to have been taking steps to improve the capability of the organisation, to put it on an upward trajectory. However, it is too soon to say whether this is just a 'honeymoon' period and the extent to which they and the Board will be able to make the necessary and fundamental changes needed in the time available.

The scale and complexity of the project and its current state of progress may mean that the Board is less able to exercise oversight on key elements of the project that still need to be resolved. There is still a lot more for HS2 Ltd. and its Board to do if it is to be in a position to deliver the project effectively.

7.2 Trust.

There has been a significant lack of credibility of HS2 Ltd.'s costs, with the same cost envelope of £55bn being quoted for the last four years. The lack of credibility in HS2 Ltd.'s estimates is a major factor in the uncertainty in the supply chain, which believes Network Rail has a far greater understanding of construction costs than HS2 Ltd., thus providing more supply-chain confidence in the certainty of proposed works on the NR system.

It was evident from long before Royal Assent of Phase 1 that costs were increasing; a decision appears to have been made to hide these from parliament and stick to the original figure. The letter from the Secretary of State Patrick McLaughlin MP to the Chancellor, George Osborn MP dated 11 May 2016 stated that DfT could not keep within the budget but must keep this secret for risk of parliament throwing the project out due to low BCR.

Low estimates meant low budgets – starting with land purchase; hence the refusal to accept the higher estimates given by Doug Thornton and Andrew Bruce. The resulting lack of money from Treasury had a serious effect on HS2's ability to buy property at the right time and the consequent failure to do proper site investigations, much to the anger of property and businesses affected. There is much evidence of this from stakeholders affected and their members of parliament, and a number of senior HS2 Ltd. staff members who objected to this apparent cover-up and were subsequently sacked or paid off with Non-Disclosure Agreements. Many have expressed the wish to give their evidence to this Review, but recent threats of legal action by the DfT has put them off.

This policy to keep information from parliamentary and public scrutiny is confirmed by the witness statement by DfT's David Yass in connection with an appeal by Dr Paul Thornton in the first tier Tribunal EA/2018/0111. Mr Yass argues that the public interest in withholding this information significantly outweighs any public interest in disclosing it because,

“if advice was disclosable, significant harm could follow including:

g) detractors of the HS2 programme may use such information to renew their criticism of the HS2 programme, which could result in cancellation of the HS2 programme by government’.

For a public body supposedly reporting to Parliament, this is indeed a brave statement.

Thus, I also believe that parliament was misled – either by HS2 Ltd. or ministers – into giving Royal Assent to the Phase 1 Bill without the up to date and higher cost estimates than in the original Estimate of Expenditure. It is clear that the above organisations were well aware of the cost increases over these years. In spite of this, Nus Ghani MP and other ministers have continued to say as late as March 2019 that the spending envelope was unchanged at £55bn.

This was also confirmed by Mark Thurston, Chief Executive of HS2, when interviewed in the Panorama programme of December 2018:

“I’m not worried about us overspending”

“I’m confident we have a budget we can stand by”

“No, we’re not over budget”

Then just a few months later Allen Cook, the new Chairman of HS2, publishes a review of HS2 Ltd. which indicated a substantial cost increase (35% for Phase 1 alone) and extended construction programme. I question how such a massive increase could only have been identified over a few months in early 2019, especially when the DfT website indicated that £12m had been spent on consultants for cost estimating. This figure has now been removed from the DfT website, no doubt because it was embarrassing.

All this does not give me confidence either that HS2 Ltd. has the necessary corporate ability to take the project forward, or that the Department for Transport has the correct policies and structures to manage such projects on behalf of the whole government and reporting to parliament.

7.3 Is HS2 Ltd. fit for purpose?

Before any decision is made around a Notice to Proceed for Phase 1, including an ongoing commitment to HS2 Ltd. to manage it, HS2 Ltd. and its Board would need to demonstrate improvements in the following areas:

- Cost estimation and management. HS2 Ltd. must demonstrate that it has adequate control of costs, and how it will learn the lessons from Phase 1; and how it will flex designs and specifications to ensure delivery within cost.
- Technical, construction expertise: HS2 Ltd. must demonstrate its capability in this area and its plans for improving this.
- Stakeholder engagement including with property owners whose premises are being acquired and with local authorities along the line of route.

Given the scale of the problem I question whether this can be achieved in a reasonable timescale. It is of concern that some of the senior managers who must share responsibility for past failures – of an inappropriate and costly specification, of poor management and cost control – are still employed as consultants to HS2. If there is to be an ongoing role for the company under new leaner management, there is no role for such people from the past.

HS2 Ltd.'s governance arrangements need to be updated to reflect the project's complexity and scale. It will be for DfT as the client to determine any changes that should be made.

Thus, I considers that any changes to HS2 Ltd.'s governance arrangements could include for Phase 1, establishing, under a Supervisory Board, the following sub Boards for: (I) London stations; (ii) Birmingham stations; and (iii) Civils/Rolling Stock/Systems.

Moving to this model will also allow for potentially shifting to a delivery model whereby different organisation deliver (I), (ii) and (iii);

It may be beneficial to appoint an independent technical and commercial auditor reporting to the DfT and Treasury to provide a regular and detailed report on HS2 Ltd.'s performance etc. This was done by the private sector banks funding the Channel Tunnel to provide an independent view (called the maître d'oeuvre) of the construction of the Channel Tunnel to ensure that the banks' money was safe.

7.4 Contract management

I comment on HS2 Ltd.'s procurement and contracting approach. On risk transfer, risk should be held by those who are most able to manage it and carry it. Initially, there was far too much risk placed by HS2 Ltd. on its contractors, but this appears to have changed at the

insistence of the main contractors; inevitably, this will put more risk and contingency onto HS2.

The size of the contracts relative to the balance sheets or market values of many of the contractors, along with HS2 Ltd.'s approach to risk, will have inflated prices initially; this is also a reason why the supply chain contractors are reported to prefer to see smaller, more risk manageable schemes based on the Network Rail approach.

There is also evidence of some over-specification in the contracts (especially initially). Lessons from Phase 1 need to be learnt and applied by HS2 Ltd. in further phases.

I also question whether there are instances of the supply chain refusing to do certain parts of the works and/or take on risk

In connection with the Main Works Civils contracts, the Review has heard how integrated management teams (comprising HS2 Ltd. and its contractors) are being developed and progressed. This may be the only way forward in the short term but is likely to result in higher costs. The alternative is to seek to restructure the contracts into smaller and more manageable sections and restart the tendering process from scratch. This might be beneficial to the works but would result in several years delay.

7.5 Responsibility for the development of stations

Some members of the Review panel suggested that the assumption that HS2 Ltd. should build all the stations at public expense should be challenged. There may be opportunities for Local Authorities or Combined Authorities to take on the role in Partnership with the Private Sector. Some suggest that there is potential also for private sector funding to be used to pay for railway works into/at stations, but I have not found any evidence to support this view. Normally, HS2 Ltd. or Network Rail would build the station, platforms, track, bridges etc. which are the railway related works. The terminal buildings and what goes above it or around may well be financeable in the private sector.

However, evidence from previous projects shows it is unlikely to bring significant financial contributions, e.g. Canary Wharf Crossrail station contribution from CW Group was £150m, with a further £80m of retrofitting needed because it wasn't done properly, according to Mark Wild, Chief Executive of Crossrail - so in fact this was a net £70m. And that was a more commercial location than any on HS2. Also, Canary Wharf might in fact end up costing the taxpayer more than if funded by the taxpayer because of penalty clauses in the contracts - if trains do not start by a given date there is a penalty payable to Canary Wharf Group.

The possibility of HS2 Ltd. developing stations was looked into under the previous Transport Secretary but, according to one of his advisers, it was concluded that at the most commercial site, Euston, you would not get a cost saving upfront because you have to do the ground works such as the underground station, incurring a lot of sunk costs. In addition, the Phase 1 Act does not grant HS2 Ltd; enough land around stations for significant commercial development to be feasible. The same comment applies to attempts to get Birmingham and Manchester airports to build their stations, which have so far also failed.

So, it is difficult to make any estimate of how much money could be saved by using the private sector to build the railway related parts of any of the stations (the essential station facilities). The Cook report says there is a £417m funding envelope for Euston oversite development enabling works, but this is works to enable the developer to build his own scheme above the station, not the essential works to enable a station to function for passengers.

It would of course be good if the private sector, in association with local government, should, where feasible and appropriate, develop and fund parts of stations. A bespoke, specific commercial model needs to be developed to deliver this approach. Any model which is developed will need to ensure that profits from commercial development are used to pay for the station.

For the moment, it would be unwise to base the HS2 business case on attracting significant investment to the essential station facilities.

Notwithstanding these comments, it would be useful to encourage commercial developments around or above stations, for example:

- By minimising land take in certain circumstances, e.g. where it relates to multiple deck car parking as at Interchange. Freed land can add economic value, particularly if dedicated to housing or commercial development;
- By encouraging commercial development over stations. A private developer could help address that, enabled by local authority, within a commercial relationship with HS2 Ltd.
- By creating special zones around major station as was done at Canary Wharf and at Merry Hill in the West Midlands to stimulate economic development activity.

7.6 Governance and oversight by the Government & Parliament

I make the following comments on the Government's management of the project. There was too much in certain areas, resulting in governance processes which are overly lengthy; and too little in certain areas including in terms of cost management;

There is a need for Government to be more transparent and open, including ensuring that Parliament and the public is kept informed about the project's progress.

There is a lack of technical and engineering expertise within government (especially construction expertise). This has potentially resulted in higher costs (see Hybrid Bill processes).

So as part of the decision around the Notice to Proceed, the Department for Transport should set out its plan for improving how it functions as a sponsor, client, funder and shareholder including how it will improve its internal technical and engineering expertise, as well as bringing in some more effective independent auditing.

On a regular basis, the Secretary of State should, upon receipt of a report from HS2 Ltd., advise Parliament on the project's progress. There are vital lessons from Crossrail that must be learnt in terms of transparency/openness. But is this sufficient? How should ministers be held to account?

7.6.1 There is a role for parliamentary committees in challenging ministers:

Departmental committees are most effective means of challenge in Parliament. Regular provision of information by DfT/HS2 Ltd. should help ensure effective scrutiny/challenge by the departmental committees.

Other committees may not be as effective. For Example, the Public Accounts Committee tends to operate in too retrospective a manner.

The Hybrid Bill committee can only challenge powers asked for in the Bill, not the whole scheme and is generally overly reliant on information from the promoter, usually the government department.

There could be a greater scope for the National Infrastructure Commission to scrutinise the progress of HS2, reporting to parliament, and the report from the Infrastructure and Projects Authority give useful information on the progress of all major government funded projects; sadly, ministers often seem to ignore its findings.

Regional and local leaders have been involved in the development of HS2 Ltd.'s plans, especially in terms of Phase 2, but I heard evidence that the views of these bodies, although listened to, were generally subservient to the perceived needs of HS2.

Clearly, all these bodies need to be involved in developing any integrated, national transport strategy.

7.6.2 Commentary on Hybrid Bill process

Many people have expressed concern about how the process worked, whether petitioners received a fair hearing and whether the Committees behaved in a fair and transparent manner rather than if the promoter's views were always right.

Many considered that the Bills are generally too specific in allowing only minimal deviation limits, and that this may have resulted in increased costs. HS2 Ltd. & DfT should consider changing this approach for Phases 2a and 2b in areas where savings could be made without too much detriment to the landscape or stakeholders.

There is also a view that bills are too big, so overwhelming the ability of parliament to scrutinise them properly, leading to a question of whether Parliament is the best forum for detailed scrutiny of projects such as HS2. Should, instead, the Planning Inspectorate take the leading role in the detailed scrutiny of national infrastructure projects? However, removing parliamentary oversight will be controversial. I believe that, in the light of the HS2 Ltd. Phase 1 experience, the various options should be looked at fresh.

7.7 The setting of funding envelopes

While there are issues with how the funding envelope for HS2 has been set, HS2 Ltd. and the DfT need to make substantial improvements in how costs identified and controlled.

The funding envelope provides the basis for parliament to give approval to a project to go ahead. Some argue that it is not realistic for a funding envelope of estimate of expenditure prepared for the parliamentary bill process in 2013 should still be realistic six years later. However, there is no reason why an outline estimate prepared for the Bill should not include a contingency and risk. HS2 Ltd, has spent over £12m on cost consultants and still does not have a cost estimate prepared in accordance with the RMM Suite which provides a methodology allowing comparators to be easily identified as the project develops. Despite spending all this money on cost engineers, for ministers, officials and HS2 Ltd. to have allowed the budget to have more than doubled shows either a massive management failure or a massive cover-up to prevent the essential scrutiny of the spending public money.

There have been suggestions that funding envelopes should be set later in the process and inflated in line with construction cost inflation. For example, for Phase 1, a new funding envelope could be set at £54bn at the time when a decision is made to authorise the project construction going ahead. However, this would mean that, for HS2, the current funding envelope of £15.6bn on which parliament had given approval would be increased to £54bn.

I suggest that parliament needs one firm figure for the funding envelope at the time when it gives formal approval for the project. If this figure is exceeded at any stage of the project, then ministers must seek a new approval from parliament on the higher figure at a time before it is too late to change or cancel.

Appendix 1 – Terms of Reference of Review

Purpose

The Prime Minister has stated his wish to review “whether and how we proceed” with HS2 ahead of the ‘Notice to Proceed’ decision for Phase 1 (London-West Midlands) due by the end of 2019. The review will assemble and test all the existing evidence in order to allow the Prime Minister, the Secretary of State for Transport and the government to make properly-informed decisions on the future of Phases 1 and 2 of the project, including the estimated cost and schedule position.

For the whole HS2 project, the review should rigorously examine and state its view on:

whether HS2 Ltd is in a position to deliver the project effectively, taking account of its performance to date and any other relevant information

the full range of benefits from the project, including but not limited to:

capacity changes both for services to cities and towns on HS2 and which will not be on HS2.

connectivity

economic transformation including whether the scheme will promote inclusive growth and regional rebalancing

environmental benefits, in particular for carbon reduction in line with net zero commitments

the risk of delivery of these and other benefits, and whether there are alternative strategic transport schemes which could achieve comparable benefits in similar timescales

the full range of costs of the project, including but not limited to:

whether HS2 Ltd’s latest estimates of costs and schedule are realistic and are comparable to other UK infrastructure

why any cost estimates or schedules have changed since the most recent previous baselines

whether there are opportunities for efficiencies

the cost of disruption to rail users during construction

whether there are trade-offs between cost and schedule; and whether there are opportunities for additional commercial returns for the taxpayer through, for example, developments around stations, to offset costs

what proceeding with Phase 1 means in terms of overall affordability, and what this means in terms of what would be required to deliver the project within the current funding envelope for the project as a whole

whether the assumptions behind the business case, for instance on passenger numbers and train frequencies, are realistic, including the location and interconnectivity of the stations with other transport systems, and the implications of potential changes in services to cities and towns which are on the existing main lines but will not be on HS2.

for the project as a whole, how much realistic potential there is for cost reductions in the scheme as currently planned through changes to its scope, planned phasing or specification, including but not limited to:

reductions in speed

making Old Oak Common the London terminus, at least for a period

building only Phase 1

combining Phases 1 and 2a

different choices or phasing of Phase 2b, taking account of the interfaces with Northern Powerhouse Rail

the direct cost of reprioritising, cancelling or de-scoping the project, including but not limited to: contractual penalties; the risk of legal action; sunk costs; remediation costs; supply chain impact; and an estimate of how much of the money already spent, for instance on the purchase of land and property, could be recouped

whether and how the project could be reprioritised; in particular, whether and, if so how, Northern Powerhouse Rail (NPR) (including the common sections with HS2 Phase 2b could be prioritised over delivering the southern sections of HS2.

whether any improvements would benefit the integration of HS2, NPR and other rail projects in the north of England or Midlands

any lessons from the project for other major projects

Review team and support

The review will be chaired by Doug Oakervee. The deputy chair will be Lord Berkeley. There will also be a panel consisting of Michele Dix, Stephen Glaister, Patrick Harley, Sir Peter Hendy, Andrew Sentance, Andy Street, John Cridland and Tony Travers. Each will focus on a specific area of interest; they will feed in to and be consulted on the report's conclusions, without having a right of veto in the event that consensus cannot be reached.

Support will be provided by the Department for Transport. Sufficient support will be needed to allow a searching and rigorous review in a relatively short time. The review team will be provided with any papers and persons they request. Undertakings of confidentiality will be entered into with the Chair, Deputy Chair, panel, and others as necessary.

Reporting and publication

The review will report to the Secretary of State for Transport with oversight from the Prime Minister and the Chancellor of the Exchequer. It should produce a written report suitable for publication.

Timing

The review should submit its final report in autumn 2019.

Appendix 2 – letter from Lord Berkeley to Doug Oakervee



From Lord Berkeley
07710 431542, berkeleyafg@parliament.uk

Doug Óakervee Esq
Chairman,
HS2 Review Panel

11 November 2019

Dean Doung

The final draft HS2 Report

Thank you for allowing me to read this draft last Thursday. As I mentioned afterwards, I cannot support its conclusions or recommendations, and have serious problems with its lack of balance. The lack of balance is reflected in the often unquestioning acceptance of information provided by HS2 Limited and a failure to scrutinise the involvement of HM Treasury and the Department for Transport in the development of the project.

The involvement of these Departments of State is highlighted in the letter dated 11th May 2016 from the Rt Hon Patrick McLoughlin MP, then Secretary of State for Transport, to the Rt Hon George Osborne MP, then Chancellor of the Exchequer which sought to persuade the Treasury that DfT had the budget well under control so that the Treasury did not need to worry when, in fact, internal memos from within HS2 indicated a serious concern among senior managers that the £57bn funding envelope not be adhered to and that a figure of at least £84 to £86 bn was accepted within HS2 Ltd higher management in the Autumn/Winter 2016. There are also reports that, at a conference held at the Said Business School at Oxford at the same time, attended by officials from HM Treasury, the Department for Transport and HS2 directors, there was discussion that the ultimate costs at 4th Quarter 2015 prices could be as high as £100 bn.

In summary, my concerns are twofold; about the process of the report's preparation and its outcome.

The Review process meant that we had to complete the work in a very short time, and the secretariat was generally helpful in obtaining documentation and arranging meetings. However, as Deputy Chair I would have expected to be able to attend the meetings that you had with ministers, officials and HS2 from non-execs downwards, but I was not invited. There was also a marked reluctance from officials and/or you to delve more deeply into the costs of the project, with long delays in arranging meetings with HS2, something I asked for in my first week on the Review.

I also detected a trend in many of the discussions within the Review to accept that HS2 will go ahead, so that every effort should be made to minimise costs and maximise revenue, rather than look at the pros and cons of alternative options with a view to reducing costs but still giving as many benefits to those who need them most - in the regions. This trend is evident in many parts of the draft Review report, such as giving strong support for terminating at Euston whilst failing to mention the many reports, including that of the House of Lords Economic Affairs Committee, that terminating at Old Oak Common was preferred for cost and other reasons. Nor does it note generally in the text that alternatives exist in many parts of JS2 that could provide similar benefits at lower costs. In summary, the Review does not seem to answer the many issues in the Terms of Reference in a fair manner.

Secondly, on costs, you will be aware of the great concern that politicians and ministers have had over the rising costs, and their attempts to keep these from public scrutiny until the project was too far advanced to change. I suggested that Michael Byng's expertise and experience in examining HS2 costs for a number

of years would enable the Review to obtain an independent view of HS2's cost estimates, but in spite of his offering to sign an NDA confirmed in a letter to you dated 17 September 2019, officials prevented this from being done on the spurious excuse that Michael was representing petitioners. As a result, officials prevented a proper comparison between the estimates of HS2 and Michael Byng.

Thus, the comment in the draft report that 'The Panel did not have enough time to develop its own bottom up estimate of costs on the HS2 Project' is incorrect. Officials prevented it from happening until it was much too late to have meaningful discussions. On this basis, I believe that the Review should accept that a capital cost of £103 bn as suggested in Michael Byng's independent analysis is the most likely outturn cost.

It is also important for the Review to say that Michael Byng's estimate was a 'bottom up estimate', using the industry standard methodology – the 'Rail Method of Measurement' – which should have been compared with HS2 Limited Review. I am surprised that HS2 Limited did not appear to have a structured estimate for external scrutiny either by KPMG or our Review but, if no structured estimate exists, then what did the Company get for the £11.4m it admits it spent on quantity surveying and cost engineering services to 31st December 2018?

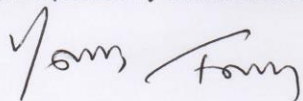
I question whether HS2 Ltd, HM Treasury and the Department for Transport, working together are really 'fit for purpose' to take such a project forward. You appear to be happy that the company has turned over a new leaf, having spoken to senior directors and non-execs, but the company's track record in controlling costs is very bad; starting at £32 bn in 2011 to £103 bn today. This is an increase of 221% even before any permanent construction work has started. Compare this with the criticism of Crossrail which is 'only 25% over budget. (From £14.8 funding envelope in 2010 to around £18.35bn today for opening in 2021).

During the period 2009 to 2019, HS2 has spent approximately £750 million on professional fees. The Company's failure to deliver a robust estimate of cost and a compliant business case is therefore damning. The Company's current negotiations on the main Civil Works contracts are also of worry, as the draft Review states. There is still a risk of delay and cost overrun here, especially on the contracts around Euston; many of the contracts appear to be more like cost-plus ones, putting even more risk on the taxpayer.

The Review is equivocal on the planned number of trains per hour; this is of course central to the BCR calculations. The draft states that it would be prudent to adopt 14 trains per hour per direction, a figure confirmed by HS2 itself and others, that no high-speed rail line in the world currently operates more than this number (except one in Japan which operates 15 at peak hours). However, when it comes to the BCR calculation, the draft Review bases its BCR on an unachievable 18 trains per hour and suggests that, by taking into account other benefits, a BCR of between 1.1 to 1.8 is achievable.

A later option in the draft offers 16 tph, but points out that, although the costs reduce by around 6%, the benefits are estimated to fall by around 24%. Nowhere does the Report provide a BCR on the basis of 14tph and a cost estimate of £103bn, probably resulting in a BCR of less than 1, meaning 'poor value for money' according to the Treasury Green Book. This may not be the answer that the Review wants, but nevertheless it is a very likely outcome. I suggest that to omit this is misleading and dishonest.

Please therefore take this letter as a formal notice that I do not support the Review Report. I reserve the right to publish my own alternative report in due course.



Lord Berkeley
Deputy Chair, Oakervee Review into HS2

Appendix 3 - Alternatives to the HS2 project

The works listed in this appendix address the issues identified by the HS2 scheme but at a much reduced cost and time for delivery, providing additional rail capacity throughout Great Britain and provide work to the contractors hoping to obtain work from the HS2 project

Taken collectively these schemes also address the points made by Sir John Armitth concerning the need for connectivity between the HS2 Project and the existing railway network, thus "killing two birds with one stone".

Each of the projects listed has been priced using the methodology developed by Network Rail so providing a "common cost language" for comparison between these schemes but it likely to total £55.3 bn on the same basis as the currently estimated cost of the HS2 project, £107 bn at 1st Quarter 2015 prices.

The list has been compiled by a group of very experienced retired senior railway operators whose expertise is in the operation of a reliable, economic and sustainable network.

A list of works is set out below:

Appendix 3.1 - HS2 Recovery or Replacement Works

Appendix 3.2 - Midlands Connect Area

Appendix 3.3 - Northern Power House Rail including Newcastle and Carlisle aspects

Appendix 3.4 - North of England and Scotland

Appendix 3.1 - HS2 Recovery or Replacement Works

Station Developments	London (Euston) redeveloped within its existing footprint	<ul style="list-style-type: none"> • Capacity • Performance • Addition platforms for Chiltern Line train service • Over site development compatible with London Mayor and LB of Camden Planning policy • Makes use of and recovers monies already spent on HS2 Phase 1 project 	
Station Developments	Birmingham "Curzon" Station completed as a regional commuter hub interchange with travelator to Birmingham (New Street) Station	<ul style="list-style-type: none"> • Capacity • Performance • Alternative routes • OHL Electrification • Station development completed to meet City of Birmingham planning and regeneration ambitions • Makes use of and recovers monies already spent on HS2 Phase 1 project 	
Route development new works	London (Euston) additional platforms connection to Chiltern Lines at Old Oak Common via tunnel from Queens Park (not Park Village East) creating new route to the West Midlands via Chiltern Lines	<ul style="list-style-type: none"> • Capacity; frees up capacity on the West Coast mainline • Basis of alternative route from London to the West Midlands • OHL Electrification • Makes use of and recovers monies already spent on HS2 Phase 1 project • Removes the problem caused to Crossrail 1 at Old Oak Common by overcrowding at interchange 	
Electrification	Chiltern Lines OHL Electrification	<ul style="list-style-type: none"> • Capacity; additional commuter route from London to the West Midlands, 	

	applying RIA methodology from Old Oak Common, Aynho Junction, Banbury, Leamington Spa to Birmingham Curzon and New Street	<p>freeing up capacity on the West Coast Mainline</p> <ul style="list-style-type: none"> • OHL Electrification, making use of the methodology advocated by the Railway Industry Association (RIA) to reduce the cost of OHLE • Additional infrastructure required at intermediate stations 	
Redevelopment or reinstatement of existing lines	Doubling and electrifying the line between Leamington Spa and Coventry	<ul style="list-style-type: none"> • Capacity; provides additional access to Coventry away from WCML south of Rugby • Performance • Additional infrastructure needed at Intermediate Stations • OHL Electrification 	
Redevelopment or reinstatement of existing lines	Reinstatement of the railway along the former Great Central Railway route from Banbury to Rugby providing access to the WCML and Trent Valley 4-track section	<ul style="list-style-type: none"> • Capacity; increases rail freight capacity from southern ports • Capacity; provides alternative north-south access routes 	
West Coast Mainline interventions	Grade segregated junctions at Hanslope and Ledburn	<ul style="list-style-type: none"> • Capacity by enabling 125 mph trains to get to and from the fast lines • Improved journey times on WCML inter-city and commuting services 	
West Coast Mainline interventions	Incorporation of under-used DC lines into WCML proper, including reassessment of Bakerloo line	<ul style="list-style-type: none"> • Capacity for London commuting services • Better use of underused assets 	

West Coast Mainline interventions	Review of Cheddington, Tring and Apsley Station	<ul style="list-style-type: none"> • Capacity improvement on slow lines • Performance 	
WCML train fleet	Ensure all trains using the fast lines are capable of 125 mph line speed during the passenger day	<ul style="list-style-type: none"> • Traffic management of fast lines during the passenger day to ensure 125 mph running • Introduction of 125 mph commuter trains - "The Flying Cobblers" 	
Midland Mainline Electrification	OHL Electrification extended from Kettering to Leicester, Derby and Nottingham to Sheffield and Leeds in conjunction with XC electrification	<ul style="list-style-type: none"> • Provides electrified high-speed route to the East Midlands and South Yorkshire • Capacity • Performance • Additional infrastructure required at stations • Extension of existing Network Rail electrification programme. 	
ECML route upgrade	Interventions and new works; enhanced running speeds, 4-tracking congested sections and removal of operating obstructions	<ul style="list-style-type: none"> • Enhance running speeds; 140 miles per hour running along the entire route to Newcastle-upon-Tyne • 4-Tracking congested sections; Between 21 miles 18 chains and 23 miles 68 chains; Welwyn Viaduct, Welwyn South Tunnel, Welwyn North Tunnel and Robbery Lane Viaduct and between 58 miles 20 chains and 75 miles 02 chains; Huntingdon to Fletton Jn • New Junctions and New Flyover and Chord at Newark, removing at grade crossing 	

Appendix 3.2 Midlands Connect area schemes

4-Tracking	Rugby, Coventry to Birmingham (New Street) or Birmingham (Curzon)	<ul style="list-style-type: none"> • Capacity • Performance • Additional infrastructure needed at Intermediate Stations • OHL Electrification 	
Reinstatement	"The Whitacre Link"; Whitacre Junction to Hampton in Arden	<ul style="list-style-type: none"> • Capacity • Alternative routes • Direct access to Birmingham Airport and NEC from the East Midlands, North East and East of England and the West Midlands • Direct route from Leicester to Coventry using existing Nuneaton Station • Triangular junction at each end of route to form "figure of eight" layout between Birmingham and Coventry • OHL Electrification 	
Reinstatement	Sutton Park Line; passenger services allowing direct access to Birmingham Curzon Commuter Station Hub	<ul style="list-style-type: none"> • Capacity • Alternative routes to Birmingham City Centre • Direct access to Birmingham Airport and NEC • OHL Electrification 	
Diversions and interventions	Lichfield, Sutton Coldfield, Walsall, Bromsgrove and Redditch commuter services to Birmingham Curzon Commuter Station Hub	<ul style="list-style-type: none"> • Capacity; frees up Birmingham (New Station) for long distance services • Alternative routes to Birmingham City Centre • OHL Electrification 	

Reinstatement and extensions	Walsall to Lichfield via Rycroft Junction and extension of Cross-City services to Burton-on-Trent	<ul style="list-style-type: none"> • Capacity; increases Birmingham "Travel to Work" area • Performance • Additional infrastructure needed at Intermediate Stations • OHL Electrification 	
Metro Extensions	Birmingham City Centre to South West Birmingham via A38	<ul style="list-style-type: none"> • Capacity; increases Birmingham "Travel to Work" area • Avoids disruption to Camp Hill and West Suburban Lines 	

Appendix 3.3 Northern Powerhouse area

Transpennine Route Upgrade	York-Leeds-Manchester	<ul style="list-style-type: none"> • Capacity • Performance • Suite of interventions – needs change to ensure whole-route electrification. • Additional infrastructure needed east of Leeds • Needs freight to be accommodated (proven possible with additional running lines on former four-track sections) 	
Electrification	Birmingham – Doncaster/South Kirby Jct, ('XCE')	<ul style="list-style-type: none"> • Carbon • Performance 	
Electrification	MML to Derby (plus Erewash) (connects with above)	<ul style="list-style-type: none"> • Carbon • Performance 	
Grade separation	Marshgate, Doncaster	<ul style="list-style-type: none"> • Performance and Capacity <p>NB: Not easy given adjacent rail routes, roads, canals and rivers and may take a more expensive 'Doncaster Avoider' as researched by Virgin in an early 2000s franchise bid.</p>	
New build	Leeds - 'Northwest Viaduct' from Holbeck (High Level) Jct to new three 260m-long platform station in Wellington Street car park. Connection from viaduct down to Armley Jct. Most built off-line.	<ul style="list-style-type: none"> • Capacity and new services • Resilience • Performance (of main station) 	
LSI (Line Speed increases) and Loops	Hope Valley (is current, delayed a further two years, scheme actually ambitious enough?)	<ul style="list-style-type: none"> • Performance • Capacity • Line speed 	
Re-opening	Matlock-Buxton	<ul style="list-style-type: none"> • Strategic capacity • Strategic connectivity • Intercity journey time • Freight re-routing (de-congesting Dore-Ambergate on MML) • Funding support from private sector from aggregates companies at Buxton 	

Transpennine Route Upgrade	York-Leeds-Manchester	<ul style="list-style-type: none"> • Capacity • Performance • Suite of interventions – needs change to ensure whole-route electrification. • Additional infrastructure needed east of Leeds • Needs freight to be accommodated (proven possible with additional running lines on former four-track sections) 	
Electrification	Birmingham – Doncaster/South Kirby Jct, ('XCE')	<ul style="list-style-type: none"> • Carbon • Performance 	
Electrification	MML to Derby (plus Erewash) (connects with above)	<ul style="list-style-type: none"> • Carbon • Performance 	
Grade separation	Marshgate, Doncaster	<ul style="list-style-type: none"> • Performance and Capacity <p>NB: Not easy given adjacent rail routes, roads, canals and rivers and may take a more expensive 'Doncaster Avoider' as researched by Virgin in an early 2000s franchise bid.</p>	
New build	Leeds - 'Northwest Viaduct' from Holbeck (High Level) Jct to new three 260m-long platform station in Wellington Street car park. Connection from viaduct down to Armley Jct. Most built off-line.	<ul style="list-style-type: none"> • Capacity and new services • Resilience • Performance (of main station) 	
LSI (Line Speed increases) and Loops	Hope Valley (is current, delayed a further two years, scheme actually	<ul style="list-style-type: none"> • Performance • Capacity • Line speed 	

	ambitious enough?)		
Re-opening	Matlock-Buxton	<ul style="list-style-type: none"> • Strategic capacity • Strategic connectivity • Intercity journey time • Freight re-routing (de-congesting Dore-Ambergate on MML) • Funding support from private sector from aggregates companies at Buxton 	

Appendix 3.4 North of England and Scotland areas

North-East of England and East Scotland			
Project	Location	Purpose	
New passenger service	Ashington – Blyth - Newcastle	1) Job opportunities and connectivity from deprived area. A lot of work already done in background. 2) Environmentally beneficial 3) Possible tram-train	
Extra tracks and avoiding line	Main line Newcastle – Morpeth	1) Speed and capacity for inter-city fast trains 2) Segregate and expand stopping services 3) permit new stations in deprived area	
New line	Berwick - Dunbar	1) Avoiding geological threats to line along cliffs 2) Increased speed on better alignment 3) Resilience	
Extra tracks	Dunbar - Edinburgh	1) Increased local services 2) Increased speed and frequency of inter city trains 3) Will avoid flyovers at Drem, Portobello.	
Electrification and widening	Borders line to Tweedbank	1) Environmental 2) Extend loops as in the original plans 3) Permit part-route services and allow faster whole route services	
Electrification and platform extensions.	Edinburgh – Fife network and on to Perth and Dundee	1) Environmental 2) Capacity	
Electrification	Edinburgh Suburban line	1) Strategic and resilience (offers emergency routes from East and West to Edinburgh Waverley)	

Widening	Saughton – Newbridge Jn.	1) Growth on west side of Edinburgh 2) Capacity and performance 3) Avoids a flyover at Newbridge Jn	
Widening	Saughton – Dalmeny	1) Capacity for commuters 2) Segregation of fast and slow 3) Tidal flow	
New Line	Through Fife	1) Essentially a cut-off. Is an old Network Rail scheme. 2) Speed and capacity to avoid very twisty line in area of high commuting 3) Avoid a further road bridge at Queensferry	
Bi-directional	East Coast where not four-tracked	1) Resilience 2) Tidal flow at peak times	

North-West of England and West Scotland			
Project	Location	Purpose	
Replace loops by two pairs of dynamic loops.	Preston - Carlisle	1) Capacity (frequency and train lengths) 2) Economy (removal of existing loops)	
Electrification	Newcastle – Carlisle	1) Resilience (diversions if either East or West Coast closed) 2) Environmental 3) Enhance commuter services at each end	
Alignment and station rebuild	Carlisle Citadel	1) Speed for both passenger and freight 2) Economy through modern track facilities 3) Capacity of the route 4) Release of land for house building	
Reopening lines	Carlisle Goods lines	1) Capacity (frequency and train lengths) 2) Safeguarding of station infrastructure	

Dynamic loops	Lockerbie	1) Speed 2) Capacity (train lengths)	
Re-alignment and new loops	Abington	1) Speed for intercity trains 2) Capacity (frequency and train lengths)	
Widening	Carstairs	1) Speed to both Edinburgh and Glasgow 2) Capacity Note: A scheme already in CP6, which gives four-tracking and bi-directional working. These could be enhanced.	
Widening	Uddingston Jn. – Rutherglen East Jn.	1) Capacity 2) Performance, both commuting and inter-city	
Grade separation	Newton	1) Capacity 2) Performance, both commuting and inter-city	
Electrification	Gretna – Ayr/ Barrhead	1) Resilience 2) Connectivity (Ayrshire to/from the south) 3) Commuting at Carlisle and Glasgow ends	