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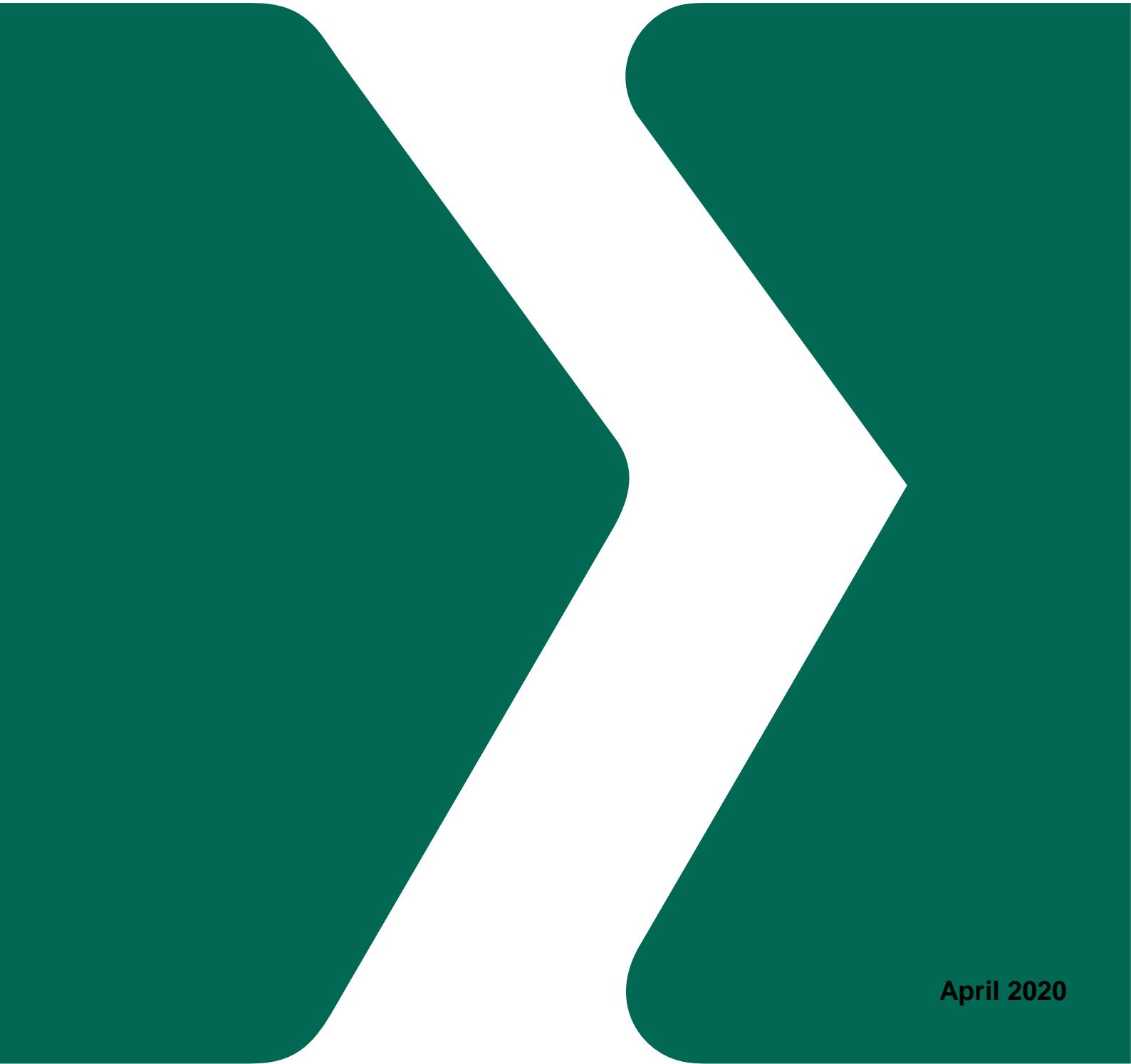
Full Business Case High Speed 2 Phase One

Moving Britain Ahead

April 2020



Department
for Transport



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Ministerial Foreword



Our future economic success hinges on our ability to better connect our towns and cities, boost productivity and rebalance opportunity fairly across the country.

With the right reforms in place, High Speed 2 (HS2) is key to achieving this. It will form the spine of our future transport network and, alongside investment in local schemes, it will unlock the revolution in the nation's public transport provision that we have promised to deliver.

This document puts forward the case for Phase One of the line, which will connect London to Birmingham along 140 miles (225 km) of new track.

It sets out the positive impact that HS2 will have not just on our transport network and economy, but also to communities across the country – and not just those directly served by the route. Importantly, this document also lays out the steps that we will take to ensure the scheme is properly run, so that its great potential is fully realised.

While recognising that transport investment has the potential to drive growth and support towns and cities across the UK, of course the costs and benefits of those investments must stack up. That is why we commissioned Douglas Oakervee to chair a review of HS2 and provide us with independent advice on whether and how to proceed. His invaluable conclusions have informed the development of this document.

This Government is clear that HS2's great potential for the whole nation continues to outweigh its costs. It will generate a vast increase in capacity, with thousands of extra seats, making life easier for travellers and better connecting our biggest cities. It has the potential to create highly skilled jobs, spread prosperity across the country and deliver world class transport infrastructure of which we can all be proud. It is now time to get on with delivering it.

A handwritten signature in blue ink, appearing to read "Andrew Stephenson".

Andrew Stephenson MP
Minister of State at the Department for Transport

Executive Summary

Government decision on HS2

- 1 On 11 February 2020 the Prime Minister announced that the Government intended to proceed with High Speed 2 (HS2), having considered the conclusions of the Independent Review of HS2, led by Douglas Oakervee, and wider advice. This was based on evidence that its potential to redistribute opportunity and prosperity across the country, provide much needed future rail capacity, and support the 2050 net zero carbon objective, continues to outweigh its costs.
- 2 This Full Business Case (FBC) for HS2 Phase One (Phase One) was prepared prior to the outbreak of COVID-19 and the period of exceptional uncertainty that this has created for the UK economy. The UK Government will do whatever is necessary to deal with COVID-19 and will also continue to invest in the country's future infrastructure. We have carefully considered whether it is right to proceed with HS2 Phase One in these circumstances and, in line with Public Health Guidance which allows construction activity to continue where it is safe to do so, have concluded that continuing is the right course of action. Much of the initial work on the main construction of Phase One will take place off-site, developing further designs and logistics plans.
- 3 The main construction works for Phase One are due to begin in April 2020 and the Phase 2a Bill is now progressing through Parliament. As part of an integrated rail plan for the North and Midlands, the Government will consider how best to scope and integrate Phase 2b of HS2 with Northern Powerhouse Rail, the Trans-Pennine Route Upgrade and Midlands Rail Hub in order to assess whether benefits can be delivered "quicker and cheaper", as set out by the Prime Minister in his speech.
- 4 The Prime Minister also made clear that as HS2 progresses, changes needed to be made to ensure that the programme is properly managed and its potential fully realised. New governance arrangements are being put in place to increase Ministerial oversight, transparency, and accountability of the HS2 project.
- 5 A dedicated Minister has been appointed to oversee the project and their focus will be on holding HS2 Ltd to account for delivery. This will be complemented by a dedicated Ministerial Committee.
- 6 New delivery arrangements will be created for Euston and Northern sections of the route, allowing HS2 Ltd to focus on the West Midlands to London and Crewe to the West Midlands. The Government will strengthen the HS2 Ltd Board with representation from HM Treasury and the Department, to ensure its efforts are fully aligned with the Government's priorities and to challenge its effectiveness. HS2 Ltd will continue its work to strengthen its capability and capacity and the Government will report regularly to Parliament on costs and schedule.

Strategic Case

- 7 The FBC for Phase One sets out the rationale for the first section of the HS2 scheme between the West Midlands and London. Phase One is not a standalone project and

the FBC has been prepared on the basis that future phases of the scheme (Phase 2a and 2b) proceed using current designs. The Government has outlined its commitment to the future phases of HS2 and the wider renewal of local and regional transport infrastructure. The Phase 2a Bill is now progressing through Parliament and in February 2019 the Prime Minister announced that the Government will undertake an integrated rail plan for the North that will consider how best to scope and integrate Phase 2b with Northern Powerhouse Rail, the Trans-Pennine Route Upgrade and Midlands Rail Hub.

- 8 Phase One will connect the West Midlands and London with 140 miles (225 km) of new track and will be the first major north-south railway in the UK for 100 years. As the Strategic Case explains, it will form the spine of the UK's future transport network and will:
 - Generate a vital increase in capacity, with thousands of extra seats
 - Act as a catalyst for wider growth and help level-up the economies of the Midlands and the North
- 9 HS2 will support these objectives while also playing a vital role in delivering the Government's net zero carbon objectives.
- 10 Phase One will include the development of four new stations and will add much needed rail capacity along one of the UK's busiest rail corridors; the West Coast Mainline (WCML). The WCML is currently the main route for passengers to major cities in the Midlands and North West; Birmingham, Manchester, and Liverpool.
- 11 Alternative interventions to upgrade the existing WCML would not provide a lasting solution with the benefits fully taken by the mid-2030s and no further scope to increase them. Any upgrade to the existing WCML would involve substantial costs, be massively disruptive for passengers over many years and result in a more overcrowded and less resilient network.
- 12 HS2 will operate as a high capacity, high-frequency service to maximise the return from what will be a costly asset. By providing high-speed inter-city services on dedicated lines, HS2 will free up train paths and platforms across the heavily congested WCML. Under current plans as well as providing additional passenger capacity on the East Coast and Midland Mainlines. This represents a once in a generation opportunity to improve services on these railway corridors.
- 13 Using innovative technology and modern track alignment will allow HS2 to reduce journey times and improve connectivity in support of the Government's commitment to level-up the country. It will join up the North, Midlands and London by effectively halving the journey times between the centres of the UK's largest cities. This will allow businesses to invest beyond London whilst still retaining ready access to it. The scheme will contribute towards sustainable growth in towns, cities and regions across the country, spreading prosperity and opportunity more evenly. It will act as a catalyst for job creation, the development of new homes and ultimately, the regeneration of major cities and towns along the HS2 route.
- 14 HS2 will play a vital role in meeting the Government's commitment to bring all

greenhouse gas emissions to net zero by 2050. While HS2's construction will inevitably have an environmental impact, rail remains the best transport option to ensure sustainable economic growth whilst meeting the 2050 net zero commitment. HS2 has the potential to take passengers off domestic flights and reduce the demand for new roads. HS2 Ltd will continue to focus on measures to reduce the carbon impact of the construction and operation of the railway.

Economic and Financial cases

- 15 The Economic and Financial Cases have been developed using cost and schedule estimates based for the first time on mature design and contractor costs. These have seen the expected costs increase significantly across most categories and a delayed in-service date compared with the 2013 targets. Following extensive challenge and benchmarking against comparable UK projects the Department and HS2 Ltd now consider these estimates, including the contingency allowed, to be realistic.
- 16 In line with best practice for other major programmes, Phase One is expected to have a staged opening. We now expect services between Old Oak Common and Birmingham to start between 2029 and 2033, with Old Oak Common acting as a temporary London terminus. This will ensure that the time required to get an optimised solution for a terminus at Euston does not delay the start of HS2 services. Once operational, Old Oak Common will be a world class station, providing passengers with the opportunity to interchange between HS2, Great Western and Elizabeth Line services. The Department and HS2 Ltd are working together to assess whether a maximum of up to six trains per hour (tph) could be operated from Old Oak Common.
- 17 The latest cost estimate range for Phase One (Baseline 7.1) is £35-45bn (Q3 2019)¹ including contingency. While setting an overall Funding Envelope for delivering Phase One, the Department is also proposing a target cost of £40 billion.
- 18 Phase One has a central-case Benefit-Cost Ratio (BCR) of 1.2:1, including wider economic impacts. The full "Y" network, which comprises all three phases of the scheme (Phase One and Phases 2a and 2b), has a BCR of 1.5:1 including wider economic impacts.
- 19 In addition to estimating the up-front costs of HS2, and providing assurance that they are affordable, the Financial Case also examines the financial outlook across the network once HS2 is operational. This analysis indicates that the introduction of HS2 will result in an improvement in the annual subsidy/premium balance for Britain's railways. This is a benefit for the taxpayer.
- 20 Rapid developments and the uncertain outcome of the COVID-19 outbreak mean it has not been possible within the FBC to undertake specific analysis to determine the outbreak's potential longer-term impacts to transport passenger demand. As is consistent with Transport Analysis Guidance, sensitivities on high and low demand scenarios that are underpinned by population and economic growth forecasts are included with the case.
- 21 The Department's forecasts on long distance rail passenger journeys is lower than

the historical growth seen over the past 25 years. The low demand sensitivity assumes that demand is 16 per cent lower than in the reference case and sees a fall in the BCR of 0.3 for Phase One, shifting the value-for-money category to poor. However, until new information is available on the potential longer-term impact of COVID-19 on long-term demand and economic growth it is not possible to say whether this will materially impact the Value for Money of HS2.

Commercial and Management cases

- 22 HS2 Ltd is tasked with the delivery of the HS2 programme and the Department is acting as sponsor, funder and shareholder for HS2 Ltd on behalf of the Government. The start of the main construction stage will require both organisations to make changes, with the Department moving from scheme development for Phase One towards oversight of HS2 Ltd's delivery. As set out by the Prime Minister, this oversight will involve direct leadership by Ministers and Department officials to hold HS2 Ltd to account against its schedule and cost targets and to ensure it delivers the scheme with courtesy and respect to the communities affected.
- 23 The Commercial Case sets out HS2 Ltd's procurement and contract management strategy. It includes the lessons learned from the main works civils procurements and how these will be applied to future Phase One procurements and the Phase 2a construction contracts.
- 24 The Management Case sets out the capabilities of HS2 Ltd, its supply chain, and its organisational readiness to deliver the HS2 Programme. This includes its performance and maturity against its organisational capability framework model. It outlines the Department's capability as sponsor and the formal governance and revised decision-making arrangements in place across the programme to deliver Phase One effectively. This includes the Benefits Management Strategy that is in place to ensure the programme fulfils the potential transport benefits and wider economic opportunities generated by the delivery of the scheme. It also outlines the Department's revised delegations and controls framework for HS2 Ltd.

Conclusion

- 25 As part of this FBC process, the Government has carefully considered the merits and disadvantages of proceeding with HS2 and has concluded that overall HS2 represents value for the taxpayer. The Strategic Case provides compelling evidence that HS2 offers the only viable long-term solution to overcrowding on the rail network transport and will be a major contributor to the objective of levelling up the economy. The Economic Case demonstrates that HS2 offers value for the taxpayer under all but the most extreme scenarios. The business case also recognises that the economic case does not fully quantify all the benefits set out in the strategic case such as the transformative benefits from changes in business location decisions. The remaining three cases make up the investment proposition and are important in providing a framework within which the project can be successfully delivered.

Introduction

Purpose of the Full Business Case

- 1 The purpose of the FBC is to support the critical investment decision, Notice-to-Proceed (NtP), for Phase One main civils construction works and to outline any significant changes from previously approved Phase One business cases. This document is being published alongside NtP in the interests of transparency.
- 2 It is the final stage of the Government's three-stage, five-case business case model, outlined in the HM Treasury Green Book, and includes the:
 - Strategic case
 - Economic Case
 - Financial Case
 - Commercial Case
 - Management Case

The HS2 programme

- 3 HS2 is the first major north-south railway line built in Britain in over 120 years. It symbolises a transformational investment in Great Britain's rail network and will form the backbone of an integrated transport system. HS2 will change how people travel by improving connectivity between eight of Britain's 10 largest cities, as well as providing much needed additional capacity to the network.
- 4 Phase One will connect Birmingham and London along 140 miles (225km) of new track and will pave the way for the development of the full HS2 network connecting stations from Crewe, Manchester, Leeds, Glasgow and Edinburgh. It is also intended to serve as the foundation for the future Northern Powerhouse Rail network and Midlands Rail Hub.
- 5 HS2 is not a standalone rail project, it will be a catalyst for economic growth supporting the Government's ambitions to level-up the economy. It will contribute towards creating the critical mass of skills, talent and expertise necessary to help raise productivity in the Midlands and the North of England. Stations on the HS2 route will contribute to local regeneration in the Midlands and the North.
- 6 In this context, the strategic goals of HS2 are to:
 - be a catalyst for sustained and balanced economic growth across the UK
 - add capacity and connectivity as part of a 21st century integrated transport system
 - deliver value to the UK taxpayer and rail passenger
 - set new standards in customer experience
 - create opportunities for skills and employment

- design, build and operate a railway which improves industry standards for health, safety and security
- create an environmentally sustainable solution and be a good neighbour to local communities

Cost and schedule update

- 7 HS2 is the largest and most complex infrastructure project undertaken in modern British history. As is common with major infrastructure projects, HS2 has faced considerable cost and schedule pressure as the project has evolved. In January 2020, the National Audit Office (NAO) criticised the Government and HS2 Ltd for underestimating the scale and complexity of HS2 and the continued over-optimism of cost and risk estimates. The Government and HS2 Ltd have now agreed a robust programme and sustainable funding framework that seeks to address this.
- 8 This FBC sets out an updated cost and schedule estimate for Phase One. Phase One is expected to have a staged opening with services from Old Oak Common to Birmingham to start between 2029 and 2033, with Old Oak Common acting as a temporary London terminus. A new Funding Envelope of £45bn has been agreed by the Department and HM Treasury based on a point estimate of £35bn and a contingency allocation above this to manage risks to the programme.

Lessons from transport for the sponsorship of major projects

- 9 In April 2019 the Department, in conjunction with the Infrastructure Projects Authority published a report "Lessons from transport for the sponsorship of major projects". The Department is putting these lessons into practice across its major projects portfolio, including Phase One. The key lessons are being applied in the following ways:
- **Using an evidenced range rather than a single target date for delivery:** In this FBC the Department has given a range for the updated delivery-in-service (DIS) target dates for Phase One rather than a single target date.
 - **Setting a realistic cost envelope:** This document provides an updated cost and schedule estimate for Phase One and is the first cost estimate based on market information for Main Works Civil Contracts and Enabling Works Contracts.
 - **Protecting benefits:** The Department has ensured that the core benefits of increased capacity and improved connectivity to rebalance the economy are not compromised.
 - **Acting decisively when in exception:** HS2 Ltd and the Department acted to understand the position and identify opportunities, when evidence emerged that the HS2 programme was subject to significant cost and schedule pressure. This document restates the cost and schedule of the programme in the context of an uncertain political environment and public pressure on the future of the programme.
 - **Testing value-for-money through benchmarking:** The Department has relied heavily on Reference Class Forecasting (RCF), an external data set providing

evidence of actual outturn performance compared with predictions for a large range of comparable projects at an equivalent level of maturity.

- **Evolving governance and personnel across the lifecycle stages:** As HS2 Ltd prepares to enter main works construction the Department has reviewed and revised its governance arrangements to reflect the lifecycle of the Phase One programme. A five-point plan to drive better oversight of the programme has also been agreed. Further details of the Department's role as sponsor and the formal decision-making and governance arrangements in place are set out in the Management Case.
- **Invest in building relationships between leaders:** The Department has established a number of forums designed to build open relationships and foster open communications in the development and delivery of the railway. These forums oversee and monitor the performance of HS2 Ltd, oversee the relationship with Network Rail, and the Department's management of the integration of HS2 with the wider network. To support governance, regular bilateral meetings between the Department and HS2 Ltd are in place to discuss progress against plans, issues and risks.

1. Strategic Case

- 1.1 Since inception, the Government has regularly restated the need for HS2 following the achievement of key milestones on the project. In 2013, alongside deposit of the Phase One Hybrid Bill, the Department set out a comprehensive body of evidence illustrating the need for HS2; and this was restated again in 2015 and 2017. At each point an increasing weight of evidence has demonstrated the pressing importance for a step change in capacity to alleviate crowding problems on the existing railway, and the scheme's potential to redistribute opportunity and prosperity more evenly across the country.
- 1.2 On 11 February 2020 the Prime Minister announced that the Government intended to proceed with HS2, having considered the conclusions of the Independent Review of HS2 (the 'Oakervee Review') and wider advice. This was based on evidence that its potential to redistribute opportunity and prosperity across the country and provide much needed future rail capacity continues to outweigh its costs. HS2 will support these objectives while also playing a vital role in delivering the Government's net zero carbon objectives.
- 1.3 The main construction works for Phase One (the route between Birmingham and London) is set to begin in April 2020 and the legislation for Phase 2a (between the West Midlands and Crewe) has been revived and is progressing through Parliament. As part of further development of Phase 2b (to Manchester and Leeds) the Government has commissioned an [Integrated Rail Plan](#) to consider how best to scope and integrate this element of the scheme with Northern Powerhouse Rail, the Trans-Pennine Route Upgrade and Midlands Rail Hub and look at whether benefits to the North can be delivered quicker and cheaper.
- 1.4 Phase One is now shovel-ready with HS2 Ltd preparing to move into the construction phase of the programme. More than 9,000 people work on the programme including over 320 apprentices, and over 2,000 businesses across the UK have contracts. Early enabling works and decommissioning activities are underway at over 60 sites including major development at Curzon Street, Euston and Old Oak Common. HS2 Ltd and the Department is working with other Government departments and local authorities on growth strategies to maximise the economic potential for communities and city regions along the route.
- 1.5 The Strategic Case confirms the strategic context and objectives for Phase One, and sets out the case for change, including how this aligns with the Government's wider agenda.
- 1.6 The key strategic principles underpinning the programme are:

- The capacity of the existing rail network cannot cope with the growth in demand for rail travel;
- HS2 is a transformational programme which will act as a catalyst for wider growth and help level-up the economies of the Midlands and the North.

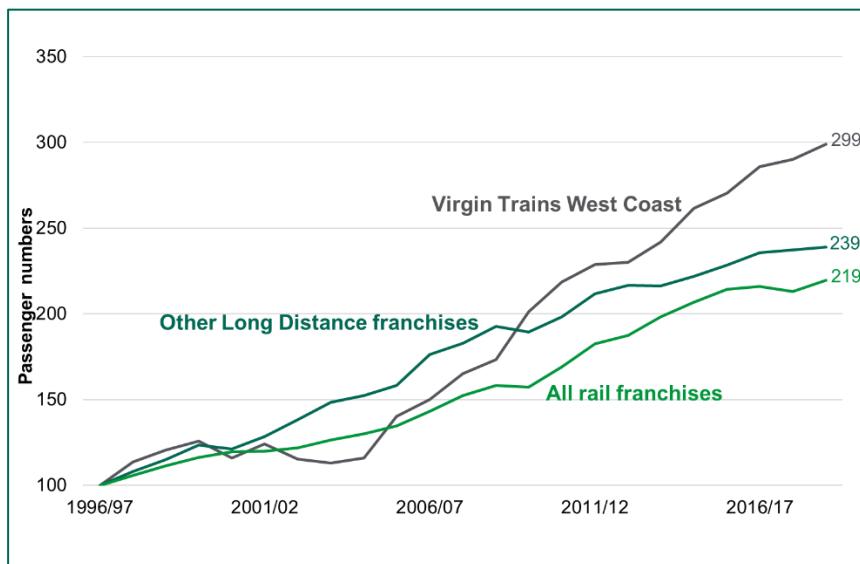
1.7 HS2 will support these objectives while also playing a vital role in delivering the Government's net zero objectives.

Capacity

Rapid increase in demand for rail travel

- 1.8 As the Oakreeve Review on HS2 sets out, the “original rationale for HS2 still holds... there is a need for greater capacity and reliability on the Great British rail network as a whole”.
- 1.9 Great Britain’s railways have seen an unprecedented period of growth since the mid-1990’s, with growth averaging at 3.7 per cent per annum for all rail. Long distance passenger demand, which underpins the market for HS2, has seen even greater growth at 4.2 per cent per annum.
- 1.10 Demand on the WCML, Britain’s key strategic rail corridor, has risen even faster. Figure 1.1 illustrates the growth in passenger journeys for all rail, long distance franchises and Virgin Trains West Coast (VTWC), who operated on the WCML, between 1996 and 2019. Between 1998 and 2008, Britain invested £14bn to upgrade the existing WCML. Demand levelled off due to significant disruption, blockades and closures throughout the works. This was at a time when other long-distance franchises saw increased demand.
- 1.11 However, since the upgrade was completed, the WCML has seen a period of extraordinary growth and this has continued every year since – despite the economic downturn from 2008. In total, passenger journeys have nearly tripled, growing from 13.2m in 1996/97 to 39.5m in 2018/19, this represents growth of 199 per cent since 1996/97 compared to 119 per cent on the wider rail network.

Figure 1.1: Virgin Trains West Coast, other long-distance franchises and total franchise passenger growth, 1996/97 to 2018/19



Source: Department for Transport

1.12 The upgrade was designed to increase peak service levels on the Fast Lines into Euston, from nine tph to 13-14tph and reduce journey times, such as those between London and Manchester, by around 20 per cent. However, despite the considerable cost and disruption involved, 10 years after completion of the works over three-quarters of the additional peak inter-city seats provided by the upgrade are already being filled (see Table 1.1 below).

Table 1.1: Peak inter-city seats into London Euston 2008 and 2018

	AM Peak (07:00-09:59)	
	Autumn 2008	Autumn 2018
Standard Class seats into Euston	6,842	11,798
Standard Class passengers into Euston	5,103	8,714
Average load factor	75%	74%
New capacity already utilised	n/a	73%
2018 load factor with 2008 seats	n/a	127%

Source: Department for Transport, Rail Analysis

WCML at breaking point

1.13 Today, the WCML Fast Lines carry 15-16tph at the busiest peak periods. This is more than the 13-14tph envisaged at the time of the upgrade due to the pressure to run more outer-suburban commuter services along with today's inter-city timetable. This is a higher intensity of operation than comparable major fast lines in other European countries, including purpose-built high-speed lines. The WCML has exhausted its available train paths and no extra services could

be run without further significant investment to enhance current infrastructure or build a new line.

1.14 Operating the WCML at this intensity makes it challenging to maintain acceptable performance levels, resulting in a frustratingly unreliable service for passengers. Minor disruption can escalate into significant delays because a train running only a few minutes late can miss its slot across a junction, resulting in a snowballing effect across the network.

1.15 Operators on the WCML have consistently operated below their Public Performance Measure (PPM) targets since the route upgrade, and these targets have been revised down for Control Period 6 (CP6) in the face of the difficulties experienced in delivering higher performance levels. For the WCML inter-city services, the last few years have seen some of the lowest punctuality figures of this decade. Figures have varied between 80-90 per cent and currently stand at below 84 per cent. Commuter services also reported some of the lowest figures of this decade, dropping from a high of nearly 90 per cent to 86 per cent. The implication of such severe levels of overcrowding would be passengers not being able to board trains, and extended dwell times resulting in worse punctuality and potentially unsafe travel conditions.

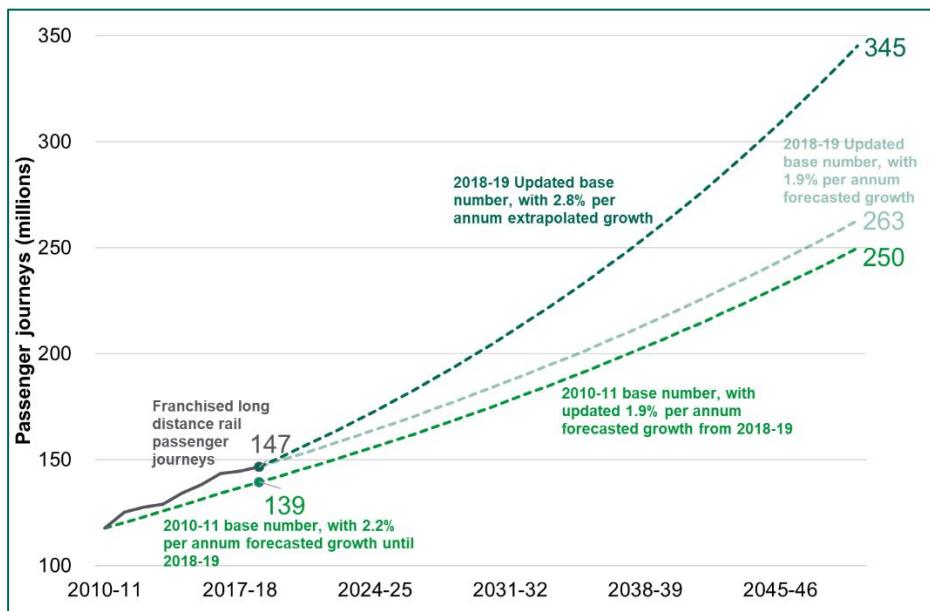
Demand for rail travel growing faster than forecast

1.16 The WCML is unable to cope with the growth in demand seen on the network since the mid-1990s. The pressure on capacity is worse than initially thought, with actual demand growth much higher than the growth forecasts underpinning the 2013 business case for Phase One.

1.17 In 2013 the Department forecast that long-distance passenger journeys would grow at a rate of 2.2 per cent annum. This is the demand forecast underpinning the 2013 Economic Case for Phase One. The forecast was revised to 1.9 per cent in 2018-19. However, actual growth in long-distance passenger journeys since 2010/11² has been at a rate of 2.8 per cent per annum.

1.18 Based on the 2010/11 forecast of 1.9 per cent growth per annum the Department predicts 263m long distance passenger journeys a year by 2050. If growth were to maintain the recent trend of 2.8 per cent there would be c.345m long distance passenger journeys a year by 2050. The potential implication of these national trends is to increase crowding to dangerous levels on the WCML (see Figure 1.2).

Figure 1.2: Extrapolated and forecasted long distance rail passenger journeys under different scenarios, 2010-11 to 2049-50



Source: Department for Transport and Office of Rail and Road

1.19 While overall demand growth at a national level has plateaued in recent years, long-distance demand growth, in particular for markets served by HS2, continues to grow at a fast pace, putting the WCML under continued pressure.

Table 1.2: selected annual average percentage growth rates for passenger demand over the long, mid and short term.

	1994/95 to 2018-19	2005/06 to 2018/19	2010/11 to 2018/19	2013/14 to 2018/19
West Midland Trains	3.8%	5.7%	4.3%	4.2%
Virgin Trains West Coast	4.7%	6.0%	4.0%	4.3%
Franchised long-distance operators	4.2%	3.9%	2.8%	2.6%
Total franchised passenger journeys	3.7%	3.8%	3.3%	2.1%

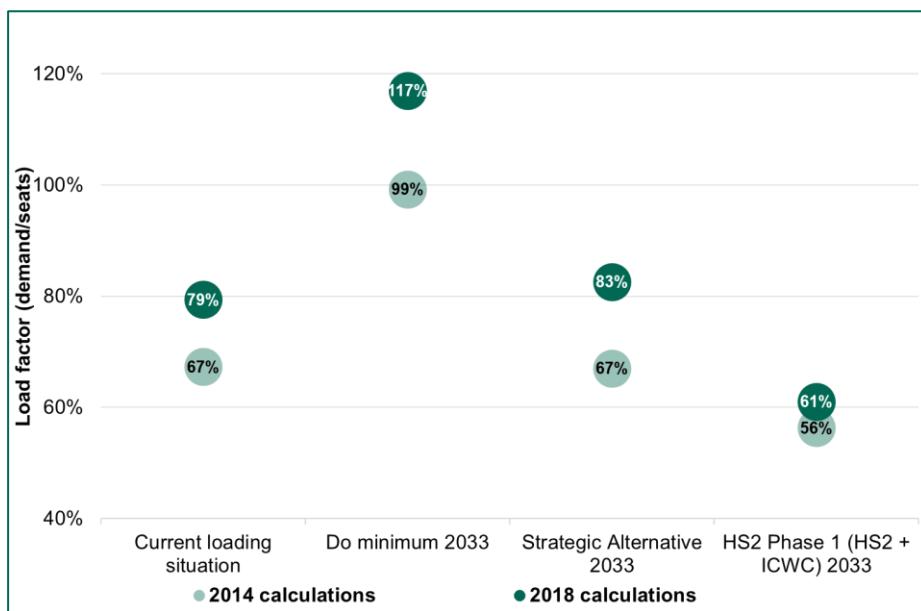
Overcrowding common on inter-city and commuter services

1.20 Capacity constraints have resulted in years of overcrowding with many passengers forced to stand on services in and out of Britain's major cities each day.

1.21 Since the 2015 Phase One Strategic Case supplement was published, crowding on the WCML has worsened (see Figure 1.3) and based on current growth trends crowding will become even worse, if no intervention is taken.

1.22 Applying the high growth scenario from the Department's 2015 forecasts (3.7 per cent per annum) the Department's Do-Minimum scenario would lead to train loading of 160 per cent by 2033, meaning there would be on average 60 per cent more passengers than seats on inter-city services on the WCML. The additional capacity provided by Phase One could markedly reduce the load factor to 61 per cent by 2033. Research by train companies³ shows that passengers start to perceive adverse impacts from crowding at 80 per cent load factors.

Figure 1.3: VTWC passenger numbers, 2014 and 2018, with three forecasted scenarios in 2033 (Growth 2% per annum)



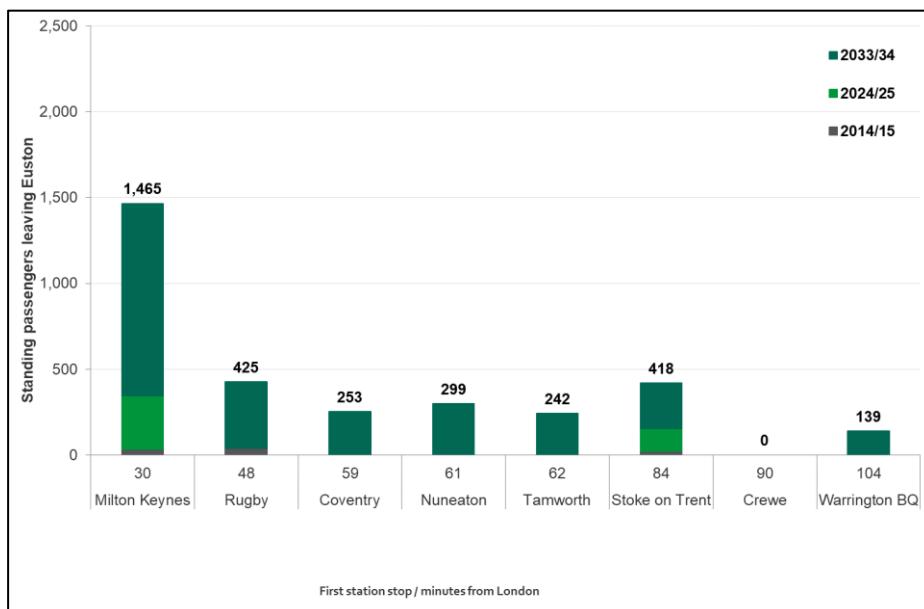
Source: Department for Transport, Rail Analysis

1.23 On inter-city services, there is an expectation that all passengers will get a seat because they are travelling long distances and often with luggage. Therefore, overcrowding is more acutely felt by inter-city passengers in comparison to commuters. The long-distance nature of services means that many of the standing passengers will be standing for an hour or more. This is particularly a problem on Friday evenings when inter-city services see the coming together of a combination of business, weekly commuter and leisure demand – including those passengers visiting families and travelling to major events.

1.24 Figure 1.4 illustrates this point for a world without HS2. For each of the trains that there will be standing passengers, the first stop on that service has been identified. This first stop is effectively the minimum period for which a passenger will stand – either because they leave the train at this point or because seats have become available due to other passengers leaving the train. In 2033/34 it is estimated that on average, 3,200 passengers will stand on inter-city west coast trains departing London in the PM peak. Of these, 1,350 (40 per cent) will be on trains with a first stop that is 59 minutes or more outside of London. On a typical Friday, when passenger volumes rise further, it is estimated that 5,900

passengers will be standing. Of these, 3,500 (60 per cent) will be on trains with a first stop 59 minutes or more outside London. A further 1,300 (22 per cent) will be standing for 90 minutes or more to stations such as Warrington.

Figure 1.4: Midweek PM – Analysis of likely duration of standing – Higher Growth Case (11-car reconfigured trains)



1.25 Major commuter services also operate on the WCML and despite several interventions to increase capacity, passengers commuting into major cities also continue to travel in severely congested conditions. Figure 1.7 shows that on average all morning peak trains into major cities are in excess of capacity and have been so for at least the last five years. Between 10-20 per cent of passengers have to stand. The only exception being in Manchester in 2018 where a new timetable was introduced in May 2018 adding more seats.

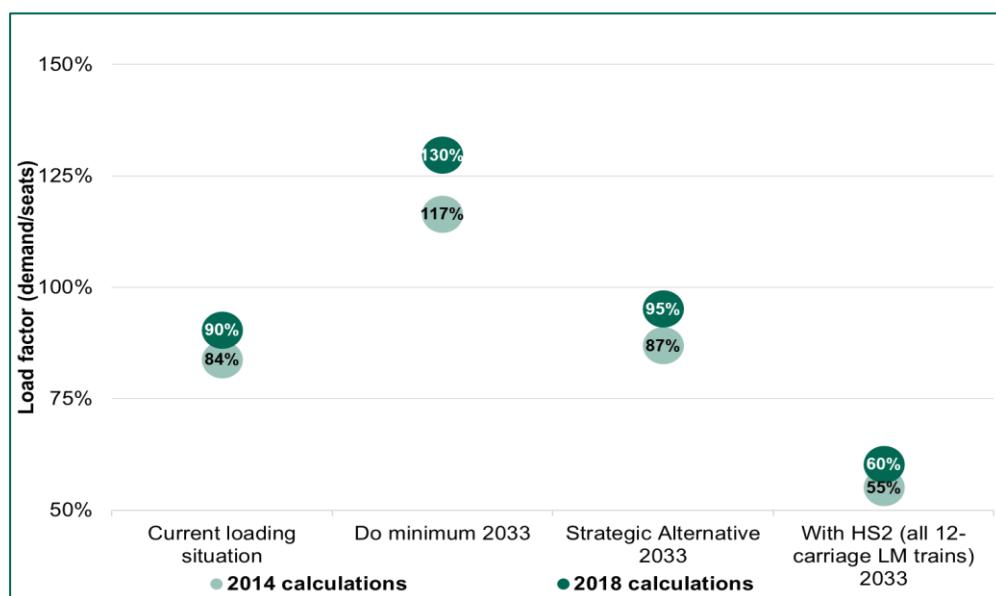
Figure 1.5: Percentage of passengers standing (green) and in excess of capacity (grey), 3 hour AM peak – 2014-2018



Source: Department for Transport

1.26 Crowding on West Midland Trains, who run the commuter services on the WCML, is around 90 per cent across the peak. It is forecast to worsen to around 130 per cent if no additional capacity is added to the network (Do-Minimum, Figure 1.6). These crowding figures are materially worse than when the last analysis was [published in 2015](#). The potential released capacity from HS2 would reduce loading to 60 per cent.

Figure 1.6: LM/WMT passenger numbers, 2014 and 2018, with three forecasted scenarios in 2033 (Growth 1.8% per annum)



Source: Department for Transport, Rail Analysis

1.27 Overcrowded travelling conditions coupled with an unreliable service has an impact on the productivity of people and businesses. Reduced congestion and improved reliability has an impact on transport choices made by people and that has an impact on economic activity and levels of productivity. In addition, when searching for jobs people make decisions based on the ease and reliability of travel and unreliable and crowded services mean businesses do not get access to the widest pool of labour. Capacity constraints must be addressed to level-up the economies of the Midlands and the North.

1.28 The WCML is intensively used, ageing and effectively full and the evidence indicates demand continues to rise. There are limited interventions on the existing network that would accommodate a sustained period of further growth and offer value to the taxpayer. The WCML is an important route for travel connecting London with major cities in the Midlands and North West; Birmingham, Manchester, and Liverpool. A new railway is the only feasible solution. HS2 symbolises a transformational investment in the UK rail network, and Phase One will be instrumental in tackling capacity constraints and reliability issues on the WCML.

Strategic alternatives

- 1.29 In developing the case for HS2, the Department has previously considered several alternative strategies to deliver similar benefits. This appraisal was undertaken prior to the deposit of the Phase One Hybrid Bill in 2013, drawing on previous sets of alternative work (also undertaken in 2010, 2011, 2012).
- 1.30 As is usual practice at FBC stage, this document focusses on understanding the evidence base on a single option, in this case, the scheme as set out in the Phase One Act. However, during the period of the Oakervee Review, the Government has rightly re-examined whether there are any alternatives that could deliver some of the capacity and connectivity objectives of HS2. This work has focussed on looking again at the previous strategic alternatives work to identify whether these conclusions still stand and examining interventions that could boost capacity in the immediate term.
- 1.31 The previously examined package of alternatives to Phase One, known as P1 included the following interventions:
- Four-tracking various parts of the WCML (Attleborough to Brinklow, Beechwood Tunnel (Berkswell) to Stechford, Chat Moss Line (Earlestow to Roby))
 - Dynamic passing loops for freight (at Shap and Beattock, North of Preston)
 - Station upgrade works at Warrington to enable splitting/joining
 - Grade separated junction at Colwich and Ledburn
 - Power supply upgrade
 - Speed improvements in Northampton, Preston and Lancaster
 - Additional rolling stock
- 1.32 The P1 package was costed at £5.9bn (2019 prices) in 2013 including both infrastructure and rolling stock costs. In the 2013 HS2 Strategic Case it was concluded that P1 offered little capacity uplift and marginal journey time improvements compared to HS2 and sacrificed suburban service capacity and services to intermediate stations. No additional freight capacity was provided by the P1 package. When compared in transport economic terms, the benefits of P1 were estimated at c.30 per cent of those delivered by Phase 1 of HS2.
- 1.33 Given that the rate of growth in passenger journeys has exceeded the economic demand forecasts used at the time there is now a need for more capacity than P1 is able to provide.
- 1.34 An indicative assessment suggested that P1 had higher levels of disruption (410 weekend closures of the WCML) to the existing network during construction than Phase One (233 weekend closures) and intensified usage of the WCML leading to higher risk and poor performance and service disruption during operation.

1.35 The Department has since reassessed the case for P1 and concludes that the likely capital cost of the upgrade package was under-stated as it omitted some scope required to deliver the train service specification but also did not account for the cost escalation that has been observed rail enhancement projects since then.

1.36 Disruption was quantified by Network Rail to be dependent on the capital investment on their network. Given this methodology, our best estimate is that the disruption caused by weekend closures to do the work would likely be two to five times higher than previously assessed.

1.37 The Department made an original assessment of the strategic alternatives against the objectives set for HS2 in the 2013 Strategic Case and published a revised assessment of the strategic alternatives in 2019.

Table 1.3: 2013 and 2019 assessment of strategic alternatives

	2013 Assessment	2019 Assessment
Capacity	Strategic alternatives do not provide sufficient additional capacity to meet the long-term needs for the north-south railway.	Phase One continues to generate 21,200 additional peak seats on the West Coast corridor which is over three times more than the Phase One alternative (7,200 seats).
Released capacity	Strategic alternatives do not provide significant additional released capacity for commuters and freight on the WCML.	Phase One continues to generate up to 20 freight paths compared to zero from the Phase One alternative.
Performance	Strategic alternatives fail to offer a robust solution to the problem of resilience and performance, particularly on the WCML which suffers from unacceptably high levels of unreliability.	Resilience and performance on the WCML has continued to perform unacceptably, with around 50 per cent of long distance trains not arriving at the terminal at its advertised time.
Disruption	Strategic alternatives would significantly disrupt services on existing lines as construction work is carried out over a period of many years.	The strategic alternatives would cause more disruption for a comparably lower level of benefit to HS2. During the WCML upgrade (1998 to 2008), passengers suffered an unacceptable level of closures which undermined the intercity passenger market (to the extent that the London to Manchester aviation market grew considerably).

Connectivity	<p>Fail to provide the scale of connectivity benefits for the major cities of the Midlands and the North. This, together with limited capacity gains in the longer term for commuters, freight and long-distance travel, means that they would not achieve the overarching economic aim set for HS2.</p>	<p>HS2 continues to generate capacity and connectivity improvements on a larger scale than any of the alternatives proposed.</p> <p>HS2 continues to generate 42 per cent journey time improvements between London and the West Midlands and 20 per cent to the North West. These figures are 0-13 per cent and four per cent, respectively under the Phase One alternative.</p>
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1.38 The Department has separately carried out an assessment of possible short-term strategic alternatives to Phase One for planning purposes during the Oakervee Review, in the event that Government chose not to proceed with HS2. These interventions on the WCML were designed to accommodate continued growth on the WCML but differed from P1 in that they prioritised maximising capacity to commuter and intermediate destinations by:

- replacement of existing rolling stock with IEPs or high density commuting rolling stock;
- infrastructure investment such as grade separation at Ledburn Junction;
- moving the Scottish sleeper service to another London terminus.

1.39 If demand on the WCML continues to grow at its current rate, it could grow by a further c.80 per cent in the next 15 years (before the full HS2 network is opened). These interventions could accommodate this increase in demand but would not provide a lasting solution in the sense that the benefits would be fully taken by the mid-2030s with no further scope to increase them, and all involve substantial cost in themselves. Some would have other drawbacks such as loss of regional connectivity.

1.40 Any infrastructure investments on the WCML would result in significant disruption to existing services during construction. Track access is one of the key constraints and was a major cause of disruption and cost driver of the West Coast Route Modernisation (WRM) programme between 1998 and 2008, [according to a study by the NAO in 2006](#). Busy mixed used traffic on the WCML means there is reduced opportunity to deliver productive shifts on midweek nights and therefore upgrade work must be concentrated at weekends. Possession of the track for engineering work through extended blockades caused severe disruption for rail passengers and train operators during the WCRM.

1.41 In recent advice to Government, Network Rail re-confirmed that it had yet to see any credible proposals for material increase in capacity on the WCML short of building a new line. Furthermore, if HS2 were not to go ahead there may be adverse impacts on the classic network, namely:

- there is potential for inter-city services to be slowed down to reduce the speed differential between the mix of services using the network;
- capacity during the busiest times could be “rationed”, either through pricing or requiring reservations, although recognising that the standard fares on the WCML for long distance flows are already higher than other inter-city routes; and
- investment in the existing network could be more disruptive, add less capacity and offer poorer value-for-money.

1.42 After a decade of planning, design and preparation HS2 Ltd is ready to commence main civils construction works for Phase One. The strategic alternatives outlined above are much less mature than HS2 Ltd’s existing plans and would require scheme development, consultation, detailed design and securing powers. At this stage of Phase One development reverting to an alternative scheme could set back the transformation of Britain’s rail network, and would not deliver the benefits to the North and the Midlands in the short to medium term. As previously stated the WCML is at breaking point and unable to cope with the growth in the demand.

1.43 HS2 will deliver uniformly high-speed services. Operating all trains at a similar speed will make maximum use of track capacity to deliver a high frequency service. Once the full HS2 network is complete HS2 trains will service 25 stations across the UK. Up to 18tph, with capacity for up to 1,100 people each will run on HS2’s brand new track, and fast inter-city services will carry more than 300,000 people each day: 100m people a year. None of the alternative schemes that have been examined are able to deliver the same level of capacity benefits.

Released capacity

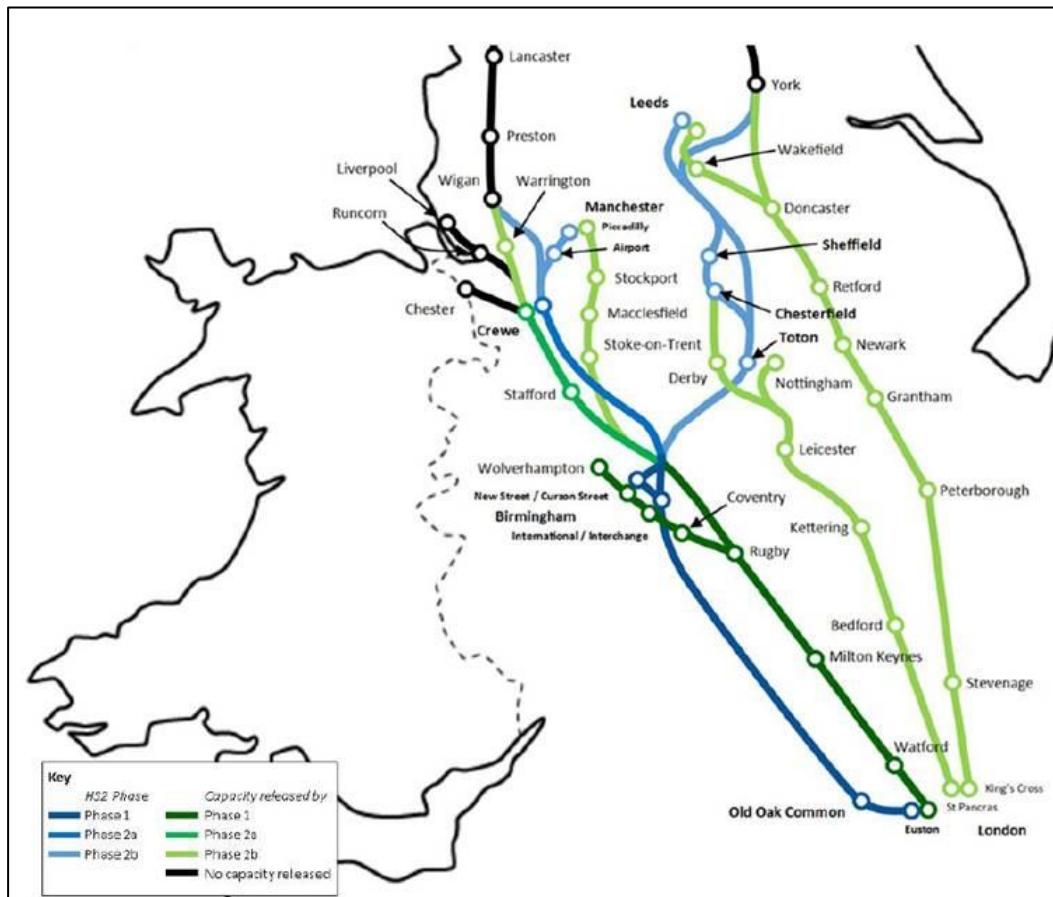
1.44 HS2 provides high-speed inter-city services on dedicated lines. Under current plans HS2 will free up train paths and platforms on the WCML and provide additional passenger capacity on the East Coast Mainline (ECML) and Midland Mainline (MML). This presents a once in a generation opportunity to improve services on these corridors, by releasing capacity on the existing network to permit more commuter and local services to locations not directly served by HS2.

1.45 HS2 will deliver improved capacity, speed, and in some cases frequency for about 25 destinations directly serviced by HS2. In 2017, the Government set out its analysis of the benefits of the released capacity created by HS2. It described how released capacity might be used at each phase of HS2’s construction. It could for example free up capacity on the southern part of the WCML. This will not only improve passenger experience by reducing overcrowding on peak time

trains but will also allow train operators to run more varied and frequent services, Figure 1.7 shows the large areas of the network where capacity will be released by HS2.

1.46 Decisions on the use of released capacity on the conventional network will be made in the run up to HS2 becoming operational.

Figure 1.7: Released capacity on conventional network as a result of HS2



Source: Department for Transport

1.47 HS2 offers the potential for more services to run on key commuter lines into Birmingham and London in Phase One, and into Manchester and Leeds in Phase 2b. Key commuter stations on the WCML such as Berkhamsted, Hemel Hempstead, and Watford Junction will benefit from released capacity in Phase One.

1.48 HS2 could also provide opportunities for additional commuter services into London from places such as Milton Keynes, Northampton and Rugby. These services currently suffer from overcrowding. For example, in 2015 services to Milton Keynes from Euston between 5pm and 6pm had 15 per cent more passengers than seats. Figure 1.8 shows an indicative plan for how WCML services into Euston might look once Phase One is operational.

Figure 1.8: Indicative plan of services of the WCML and HS2 following introduction of Phase One services

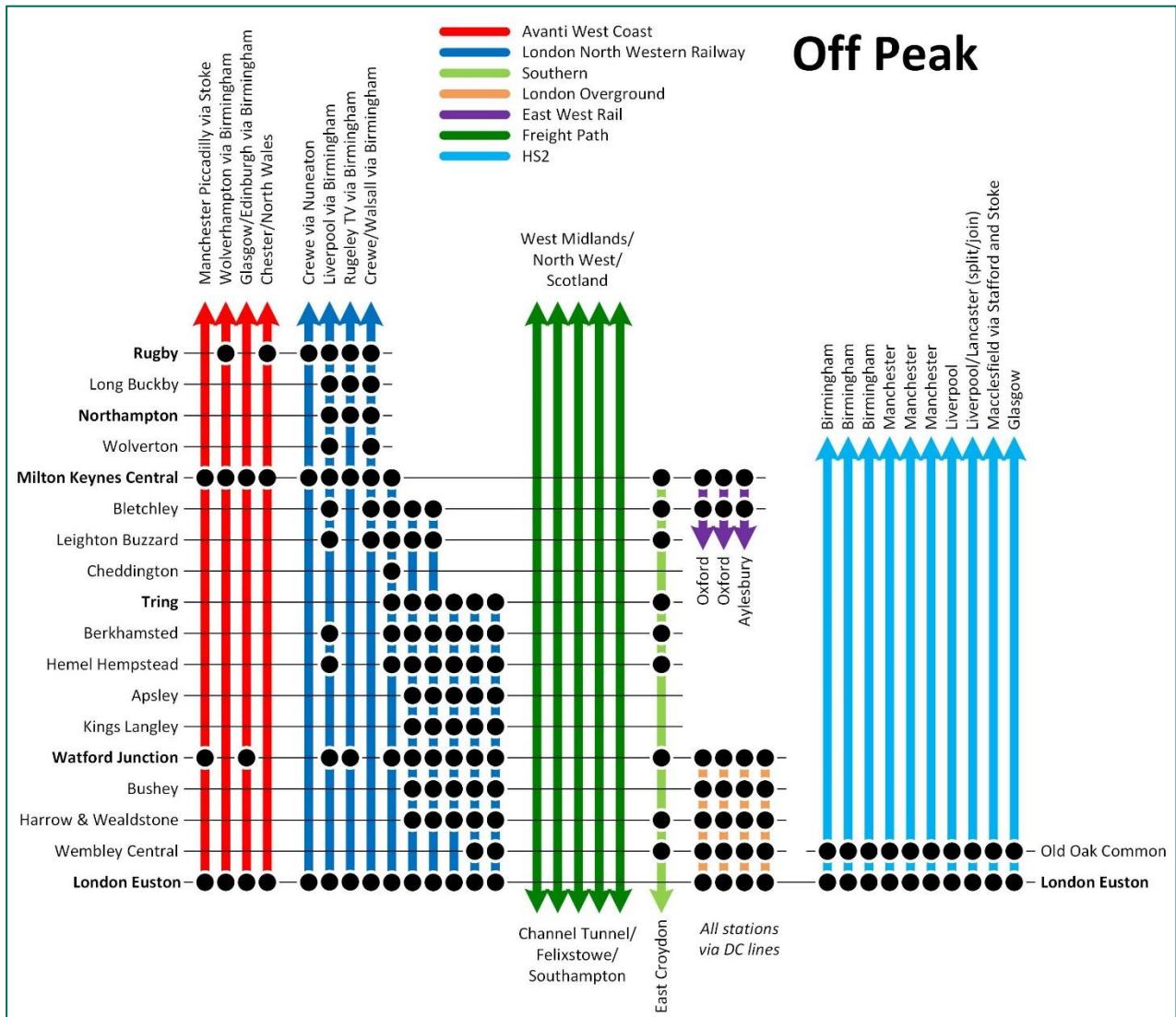
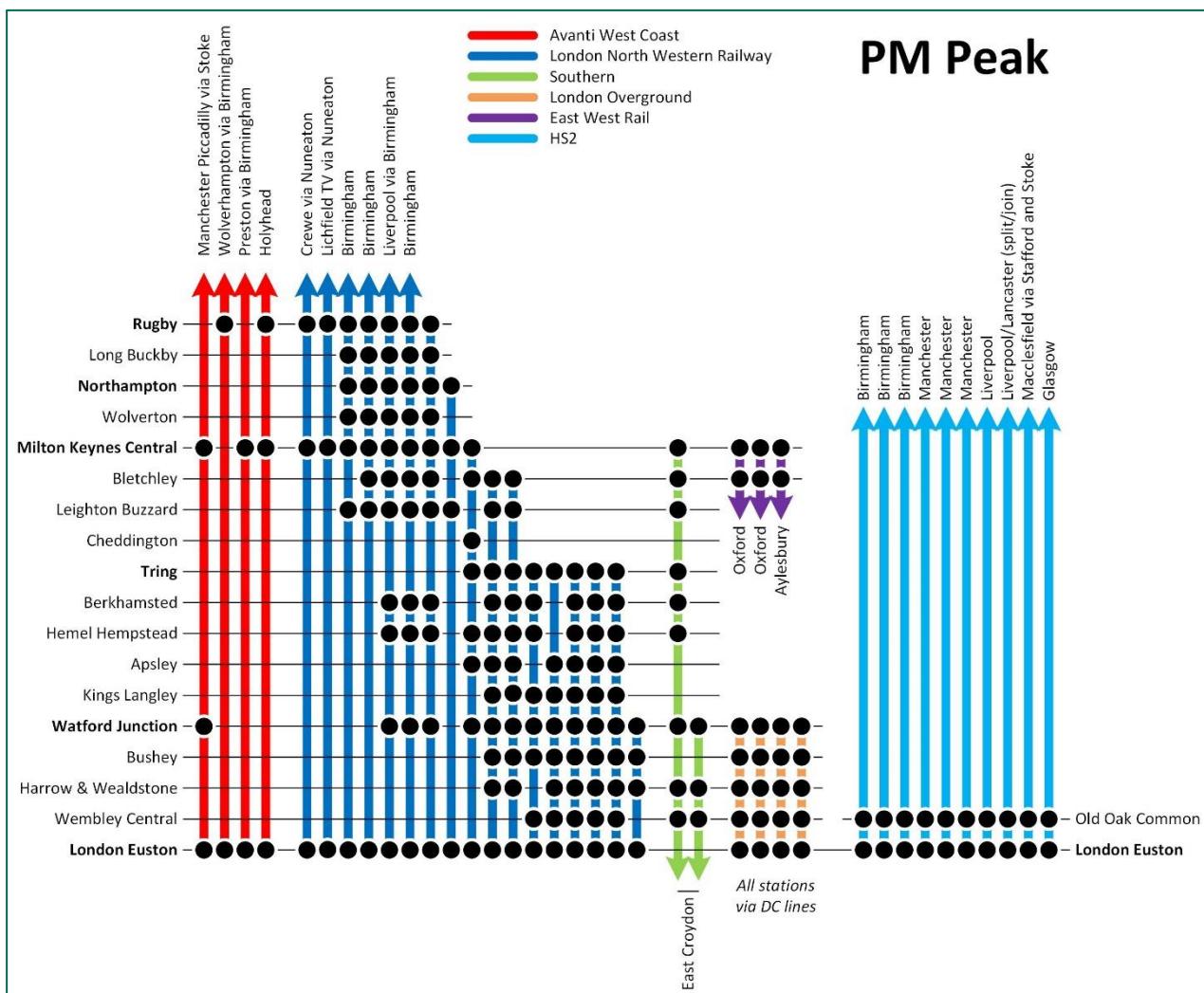


Figure 1.8 (cont.)



Source: Department for Transport

- 1.49 Under current plans Phase 2b would release further capacity on the WCML north of Birmingham and would also free up additional capacity on the ECML as services from London to Leeds, York, Doncaster, Newcastle and Edinburgh move to HS2. The space created on the southern part of the ECML would allow for additional commuter services between London and locations such as Peterborough and Cambridge. While on the northern part of the ECML, released capacity would free up lines in the area surrounding Doncaster.
- 1.50 The train paths released by HS2 could be used for new long-distance freight services, particularly between the West Midlands and London supporting manufacturing in the regions. HS2 could provide space for an extra 20 WCML freight paths. Demand for freight services is forecast to rise significantly over the next 20 years. This additional capacity will have the potential to help meet this demand and remove significant quantities of freight from the roads, bringing with it improved air quality and reduced road congestion, contributing to the Government's carbon reduction targets. Rail freight produces 76 per cent less carbon emissions than the road equivalent.

1.51 The Oakervee Review has recommended that “much more work needs to be done jointly between HS2 Ltd, DfT, Network Rail and the Shadow Operator in an integrated GB rail plan to maximise these benefits and articulate them clearly”. In November 2019 the Department appointed First Trenitalia as the West Coast Partner and HS2 Shadow Operator. A key role for the Shadow Operator, working with HS2 Ltd and Network Rail, is to provide expert advice on how best to use the capacity released on the WCML. This advice will form the basis of decisions to be taken closer to the opening date of HS2 on the specification of train services on both HS2 and the conventional network, in order to maximise the benefits of this additional capacity.

Levelling-up the economy

Poor connectivity promotes regional disparity

1.52 HS2 is a core part of the Government’s levelling-up agenda and is expected to contribute towards sustainable growth in towns, cities and regions across the country. It is intended to act as a catalyst for job creation, development of new homes and regeneration of major cities and towns along the HS2 route and transform regional connectivity in the Midlands and North.

1.53 Current journey times, crowded travelling conditions and reliability of train services mean connectivity between Britain’s major cities, in particular, between the cities of the Midlands and the North of England, is poor. The practical effect is that fewer passengers make journeys by rail between these places, restricting access to labour supply for businesses and fewer businesses trading with each other.

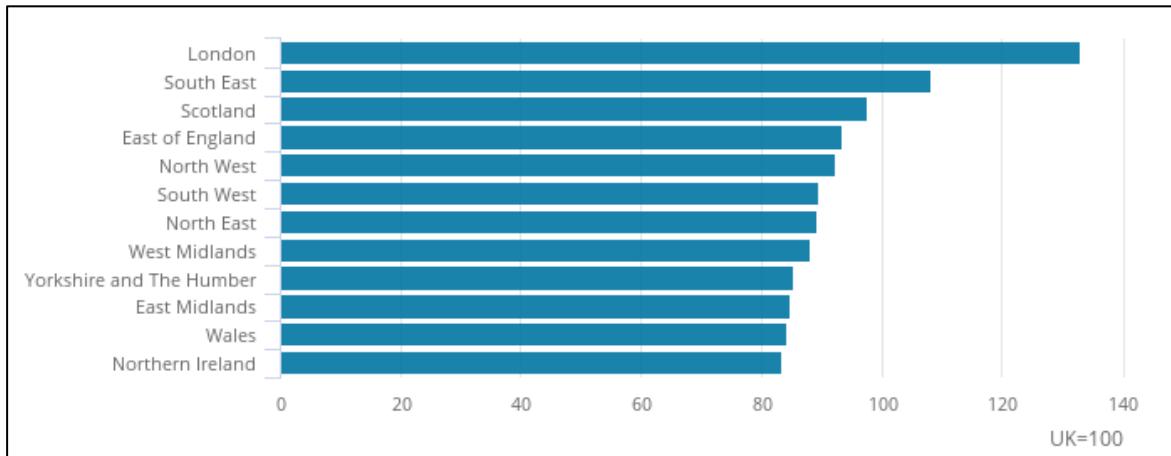
1.54 The macroeconomic impact is an unbalanced economy with economic prosperity centred in London and the South East. [According to the OECD](#) the UK has the sixth highest regional economic disparities among 30 OECD countries and recorded the fourth largest increase in disparities between 2000-2016. The Northern Powerhouse Independent Economic Review (NIER) highlighted that poor transport connectivity, reliability, quality and inadequate capacity are all acting as a constraint on productivity and economic growth in the North of England.

1.55 The UK has a long running nominal productivity gap with the six other G7 countries. [In 2016 the UK had a 23 per cent productivity gap with France and the US](#). This is in a large part due to a persistent gap between the Midlands and the North and the average for England.

1.56 Figure 1.9 shows labour productivity for the regions of the UK. London and the South East are the only regions with productivity above the UK average. GVA per hour worked was highest in 2017 in London, at 33 per cent above the UK average. In the South-East productivity was eight per cent above the UK average. The regions of the North of England and the Midlands (the North East, the North West, Yorkshire and The Humber, the East Midlands and the West Midlands) [reported productivity levels between seven per cent to 15 per cent](#)

below the UK average. The UK is not taking full advantage of the economic potential of its regions.

Figure 1.9: Labour productivity (gross value added per hour worked) by NUTS1 region, unsmoothed, current prices, 2017



Source: Office for National Statistics

- 1.57 Increasing productivity is critical to increasing economic growth, and the UK cannot rely on growth in London alone. It would not be reasonable to expect a sustained further rise in growth in London. London would need to grow by 70 per cent for UK productivity to meet international comparators. An unbalanced economy also puts enormous pressure on economically high performing areas, such as London, in terms of population growth, affordability of housing, and strained infrastructure. The gap in housing affordability in London and the wider south east compared with the rest of England and Wales has almost doubled.
- 1.58 To level-up the UK economy, high productivity jobs need to move from London to the regions, and particularly to the UK's major cities. High productivity jobs locate in large urban centres as companies need access to a large pool of people. Around 60 per cent of start-up businesses in the UK in 2016 were located in cities. Patterns of location and employment in the UK point to increasing urbanisation. Cities already account for around 60 per cent of UK economic activity. Rail remains the best transport option for getting people into city centres.
- 1.59 London's success as a global city has been driven in part by the effectiveness of its transport system which allows the easy flow of skills, services and products into and around the city, as well as to wider domestic and international markets. The Government is keen to replicate the success of London's transport network in the regions, improving connectivity between the cities of the Midlands and the North as well as improving connectivity in and out of these city regions. In London, in 2017, 22 per cent of daily trips used rail, compared to one per cent of all trips in the North.
- 1.60 HS2 will provide stronger connections between key urban centres, and connected programmes such as Northern Powerhouse Rail and Midlands Rail

Hub, improving connectivity between the cities of the Midlands and the North helping to raise national productivity. Labour markets become much more unified as journey times are reduced, allowing businesses and individuals better choices of who to hire or where to work. A well-connected transport system enabling better transfer of labour and enabling businesses to work together more efficiently could also encourage higher foreign investment into the UK.

- 1.61 Mayor of Greater Manchester Andy Burnham said in January 2020:

"Modern railways such as HS2 and Northern Powerhouse Rail are the single biggest means to transform jobs and opportunities for people in the Midlands and the North."

"The possibilities are dramatic".

"Slash the time it takes to get between towns and cities and you transform the way people live, work and do business, creating a powerhouse of jobs and opportunities from Birmingham to Nottingham, from Manchester to Leeds and dozens of places in between."

A new railway will improve connectivity

- 1.62 A new railway offers a unique opportunity to design a network with much higher speeds, helping to improve connectivity by reducing journey times between Great Britain's industrial centres.
- 1.63 HS2 is designed to operate at 330kph routinely, with a maximum speed of 360kph. HS2 trains will run up to 177kph on the conventional network. Faster trains will deliver more frequent and reliable services between more locations.
- 1.64 For example, in Phase One the journey time from London to Birmingham will be reduced from 82 to 49 minutes. Under the current scope for Phase 2b, the journey time from London to Manchester would be reduced from 127 to 67 minutes, while travelling from Birmingham to Leeds would take just 49 minutes compared to 118 minutes today. Figure 1.10 shows the reductions in journey times that HS2 would deliver between Birmingham and a range of key destinations.

Figure 1.10: Current journey times vs HS2 journey times from Birmingham Curzon Street



A new railway– choice of high speed rather than conventional speed

- 1.65 Since the Government has determined that new capacity is required to alleviate crowding, it has looked at a number of ways to deliver that capacity. The Government has concluded that a high-speed network offers the most economically advantageous investment decision. The route alignment for HS2 requires a minimum curvature to run high speed services, which incurs some additional cost in comparison to building a conventional railway. There are also additional costs arising from design factors such as wider diameter tunnels to reduce aerodynamic effects, noise mitigation measures and strengthened electricity power supplies. The route for Phase One forms part of the High-Speed Rail (London-West Midlands) Act 2017. Along the current route running a conventional service would only reduce costs by 10 per cent but it would reduce benefits by 33 per cent.
- 1.66 There is also a tipping point at which the journey speed is reduced too far and more trains would be required to carry the same number of passengers. Trains travelling at lower speeds take longer to complete a journey. Therefore, a lower speed means a fixed number of train sets would not be able to complete as many return trips and the overall capacity of the railway would be reduced, unless more rolling stock is procured. However, that increases the cost of the railway, compounding the reduced benefit as a result of longer journey times.
- 1.67 If speed is reduced to a point which does not allow sufficient capability for recovery in the event of service disruption, then journey time and/or poor performance would increase further, ultimately decreasing the benefits of the programme.

A new railway – choice of service frequency

- 1.68 [Research from the University of Birmingham](#) states that under perfect conditions, 16tph capacity could be obtained on a high-speed line like HS2, without including recovery time. If Automatic Train Operation was provided one to two more trains per hour is possible.
- 1.69 The research makes conservative estimates regarding the average acceleration and braking rates of high speed trains and the response times of signalling equipment, which HS2 Ltd believe can be significantly improved upon with the latest generation of technology, but even without those assumptions, the research suggests 17-18tph is feasible.
- 1.70 HS2 will not only prove beneficial for long-distance passengers, thousands of people will benefit from increased commuter capacity. The new HS2 infrastructure will increase the number of peak-time seats out of London Euston from 12,100 currently to 31,200. Under current plans there will also be a substantial increase in the number of peak-time seats out of Birmingham, Manchester and Leeds. A new railway offers more choices to serve new and more destinations.

1.71 A new railway also improves connectivity across the network as released capacity on the conventional network can be utilised to offer more local and commuter connections to locations not served by HS2 services. HS2 will be a fundamental part of Great Britain's future rail network unlocking benefits for rail passengers across the country, not just those directly served by the route.

1.72 HS2 would permit more frequent local connections to Milton Keynes from its surrounding stations, including in future from the planned East-West rail link, underpinning its emergence as a regional hub. HS2 also opens-up the possibility of a distinct inter-regional express service linking stations between London, Rugby and Birmingham in order to support growth in the Northamptonshire and Milton Keynes area. In 2018 [Northampton Borough Council publicly backed HS2](#) noting that it would be vital for the economic growth of Northampton and would help to deliver its aspirations for better rail connectivity for the city.

1.73 The capacity released on the conventional network will also enable improved regional and cross-country services, and for a range of towns and cities to have new or more frequent direct connections with London.

Improved connectivity drives agglomeration

1.74 Better connectivity can drive agglomeration effects. Access to bigger markets and a wider pool of labour and suppliers enables businesses to grow more rapidly, boosting productivity in regional economies. In response to transport costs workers move to areas with higher levels of productivity due to a variety of factors such as agglomeration of capital.

1.75 Reliable, efficient, connected transport links encourage businesses to relocate to be closer together forming clusters around well-connected places. In doing so businesses are more likely to interact with each other so that knowledge is shared, and new learning takes place. It also enables workers to move to more productive jobs.

1.76 Improved connectivity and the associated agglomeration effect will boost regional economies by encouraging businesses to settle outside of London, helping to level-up the economy. Birmingham City Council is working to attract financial services, financial technology and creative and digital industries to the region. Areas outside of London have the potential to increase the level of higher skilled jobs at a relatively lower cost than London, thereby supporting increased UK productivity and international competitiveness.

1.77 Director of Infrastructure at the CBI, Tom Thackray [said in August 2019](#):

"The approval of HS2 Phase One led to record levels of Foreign Direct Investment in the West Midlands, with more than 7,000 new jobs created in Birmingham as a direct result of HS2, and over 100,000 more. We have seen and are continuing to see similar benefits right across the proposed route.

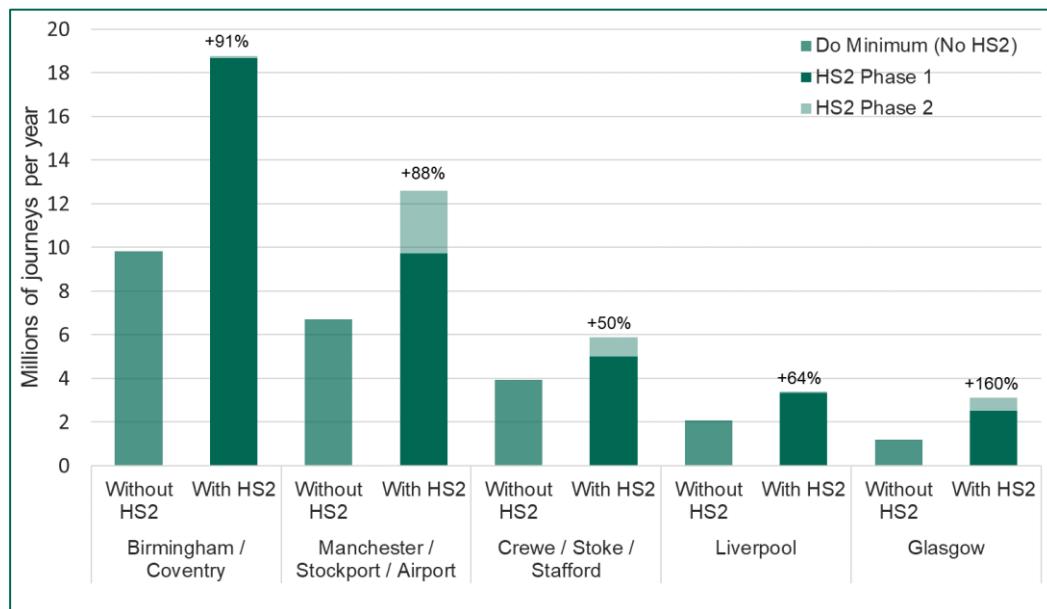
"We firmly believe that committing to HS2 in full, once and for all, will spread the flow of investment across the Midlands, the North of England and into Scotland.

The current poor connectivity in the North is a major obstacle to encouraging companies from growing in the region and is a barrier to inward investment."

HS2 will boost investment in local transport connections

- 1.78 The Oakervee Review made clear that HS2 can be part of transformational economic change, only if properly integrated with other transport strategies, especially those that seek to improve inter-city and intra-regional transport.
- 1.79 It will be vital for HS2 to be properly integrated into the conventional rail network – and with wider public transport – to ensure that people in towns and suburbs are well connected.
- 1.80 HS2 will be a catalyst for wider transport investment at the local level, which will improve connectivity in and around Britain's largest cities. Evidence of the impact of the development of HS2 can already be seen in the West Midlands, where the expansion of the Midland Metro Tramlink from the City Centre through Digbeth to HS2 Curzon St aims to maximise connectivity. HS2 will also transform links to Birmingham Airport both from Central London and Birmingham City Centre, opening up opportunities for international connectivity.
- 1.81 HS2 is designed to improve access to major and regional airports across the UK. In Phase One HS2 passengers will be able to connect to Heathrow Airport via Old Oak Common, and a high capacity people mover will provide passenger access from Birmingham Interchange to Birmingham Airport. In Phase 2b under current plans HS2 would give passengers from Birmingham and London fast and frequent access to Manchester Airport, and there are options for direct links to East Midlands Airport from the East Midlands Hub at Toton.
- 1.82 Faster, more frequent trains between the UK's largest urban centres will stimulate further demand for high speed services bringing people and places closer together. Figure 1.11 illustrates the forecast impact of the faster HS2 journey times on rail passenger demand between London and key WCML destinations, taking potential passengers away from road and air. Demand between London and Birmingham/Coventry and between London and Manchester/Stockport/Manchester Airport is forecast to grow by over 80 per cent and the market between London and Glasgow is forecast to more than double in size.

Figure 1.11: 2036/37 demand to/from London by location under Do-Minimum and HS2 operating scenarios



Source: Department for Transport

HS2 will act as a catalyst for local regeneration and new homes

1.83 HS2 is also a vital part of “local places” regeneration plans. The Department is working with local authorities and communities to maximise the transformational benefits of HS2, contributing towards the aim of creating new housing stock and prosperous communities.

1.84 Work between local authorities, Local Enterprise Partnerships and other local stakeholders, Network Rail and the Government has been key to developing these plans. A second order transformational benefit, which cannot be measured in the Economic Case is induced development. Property developers may react to the transport improvements from HS2 by upgrading housing stock, which could lead to regeneration. The development of a completely new terminus station at Curzon Street has sparked major regeneration in the area (see Annex A for West Midlands case study).

1.85 HS2 Ltd has been set targets to increase economic growth, investment and employment in the areas surrounding stations and depots served by HS2. HS2 Ltd and the Department is working with local authorities and local places to implement and measure these benefits. Around Curzon Street Station, Birmingham City Council’s regeneration plans have the potential to create 36,000 jobs and 4,000 new city centre homes. At Birmingham Interchange, UK Central is designing a new business and leisure district to deliver 16,000 jobs and 1,900 homes.

1.86 HS2 is also expected to contribute towards the Government’s aim to level-up communities across the UK by increasing availability and occupancy of housing in areas surrounding stations and depots served by HS2. The Department has

previously highlighted the challenge in providing the houses that people need and the places they need them. Transport infrastructure is one of the keys to unlocking development and delivering places people want to live.

- 1.87 Old Oak Common in West London is home to the UK's largest regeneration scheme. Capitalising on HS2 and Crossrail investment, the Old Oak and Park Royal Development Corporation (OPDC) is working with its partners to create thriving communities where people can live, work and enjoy, and a destination to drive economic growth. This project aims to create more than 25,500 new homes and 65,000 jobs and OPDC estimates that the development of the area could boost the UK economy by an estimated £7bn per year.

Figure 1.12: Estimates for potential new housing development along the HS2 route

The West Yorkshire Combined Authority estimates 21,000 homes could be created. 	The Old Oak and Park Royal Development Corporation is planning for 25,500 homes around Old Oak Common station. Regeneration around Birmingham Curzon Street Station has the potential to create 4,000 new city centre homes.	The Constellation Partnership predicts HS2 will help the creation of 100,000 new homes across the region, including Crewe, Stoke and Stafford. The new business and leisure district at Birmingham Interchange is expected to deliver 1,900 homes. 
Around 1,700 homes could be developed as part of the regeneration around Euston Station.		

Source: Various

Decarbonisation and sustainability

- 1.88 In June 2019, the Government committed to bring all greenhouse gas emissions to net zero by 2050. There remains cross-party support for decarbonisation. Decarbonising transport will be essential to achieving this ambitious target and HS2 will play a vital role in achieving the transition to net zero. Transport emissions account for 33 per cent of Britain's current greenhouse gas emissions. This section sets out the role that HS2 plays in the Government's net zero objectives.

Lower emissions than road and air

- 1.89 Rail is the most sustainable form of inter-city travel, with carbon emissions per passenger mile significantly below that of even battery-electric vehicles. Once operational HS2 will deliver significantly lower carbon journeys at 8g CO₂e per passenger kilometre by 2030, compared to intercity rail (22g), inter-urban car (67g) and domestic aviation (170g).

- 1.90 In Phase One the significant passenger capacity, coupled with HS2's ability to draw power from an increasingly decarbonised National Grid means it will be one of the most effective low carbon transport solutions for travel between London and the West Midlands in 2030.
- 1.91 By contributing to reductions in UK transport carbon emissions and building sustainable, climate resilient infrastructure, HS2 will support the UK's contribution to achieving United Nations Sustainable Development Goals 12 and 13, and delivery on the Paris Agreement.

Modal shift from road and air with HS2

- 1.92 Over the longer term HS2 has the potential to encourage modal shift, moving passengers from air and road to rail. The creation of a dedicated Ministerial Committee will aim to coordinate cross government cooperation to encourage passengers and freight services to shift to greener transport modes.
- 1.93 Shorter rail journeys (see paragraph 1.63) made possible by HS2 will compare favourably to air journey times and may encourage a shift from short haul aviation to rail, particularly between London and Scotland. Carbon and air quality benefits would both be amplified by any modal shift away from air/road onto HS2 and from road onto existing rail (utilising released capacity).
- 1.94 The younger demographic is shifting away from car travel. In 1992/4, 48 per cent of 17-20-year olds and 75 per cent of 21-29-year olds held a driving licence. In 2014, 29 per cent of 17-20-year olds and 63 per cent of 21-29-year olds held a driving licence. Investment in providing high quality, additional rail capacity could encourage modal shift, especially in young people.

Construction is carbon intensive

- 1.95 Nevertheless, the greenhouse gas emissions associated with the construction of HS2 are significant. This is mostly a result of the construction of tunnels, earthworks, bridges, viaducts and underpasses many of which have been included to mitigate other significant environmental, noise and visual effects.
- 1.96 However, the Oakreeve Review says the Government should "consider the carbon impacts of HS2 against alternative ways of managing increased demand for travel". The government accepts that despite applying best practice in carbon management, it is not possible to build a project of the scale of HS2 without generating any carbon emissions. However, to put HS2's carbon footprint in perspective, the estimated total carbon emissions from both building and operating Phase One for a full 120 years produces the same amount of carbon as just one month of the UK's road network.
- 1.97 To mitigate the environmental impacts of construction, HS2 Ltd has adopted world leading approaches to avoid and minimise the negative environmental impacts of building the railway. In doing this HS2 has a unique opportunity to drive decarbonisation in the rail and construction industries through its supply chain.

1.98 The main works civil contractors (MWCCs) are responsible for sourcing energy for construction (e.g. for tunnel boring machines). The MWCCs are tasked with achieving a 50 per cent carbon reduction against their contract specific carbon baseline.

1.99 During the design stage, the MWCCs have focused on build less and build clever solutions (e.g. to minimise energy demand and consumption), in accordance with the industry recognised carbon reduction hierarchy. A number of opportunities for potential implementation during the construction stage have been identified; for example, using low/zero carbon electricity for tunnel boring machines (TBMs).

Decarbonising energy transmission

1.100 The Oakervee Review notes that the whole rail network needs to be decarbonised if the Government is to deliver its net zero by 2050 target. High-speed rail requires more electricity to operate in comparison to conventional rail. Around one per cent of UK electricity consumed per annum is expected to be used by HS2. The vast majority (93 per cent) of energy will be used for traction power, with the remaining seven per cent used at depots and stations across the HS2 network. Given the scale of its energy consumption HS2 will have an important role to play in the future of Great Britain's energy market.

1.101 HS2 Ltd has developed an Energy Strategy that aims to reduce energy consumption across the HS2 network, and in doing so reduce carbon emissions. Applying energy efficiency measures across all parts of the HS2 network; traction infrastructure, rolling stock, stations and depots and non-traction railway systems, will reduce overall energy demand in operation, therefore minimising potential emissions.

1.102 All parts of the HS2 Ltd Energy Strategy facilitate and promote HS2 reducing carbon emissions. Optimised procurement offers the opportunity to procure renewable electricity. HS2 has the potential to create a major shift in the energy market towards decarbonisation by opting for more renewable traction power and exploring incentives for HS2 to use green energy sources.

1.103 HS2 Ltd is also exploring several opportunities for onsite energy generation at stations and depots, presenting opportunities for renewable and low carbon energy generation sources for power and heat.

Biodiversity and sustainability

1.104 The Government is committed to delivering an environmental legacy from HS2 and, as such, it was the first major UK transport infrastructure project to commit to the strategic objective of achieving 'no net loss' in biodiversity. This has since been the catalyst for other transport and development projects to commit to similar biodiversity targets and raising expectations for future Nationally Significant Infrastructure Projects (NSIPs). This commitment will be quantified through close-working with the Department for Environment, Food and Rural

Affairs (DEFRA) and Natural England to use and build on DEFRA's existing metrics and guidance.

1.105 HS2 is being designed to avoid or reduce adverse impacts on habitats, protected species and other features of ecological value, where reasonably practicable. Where adverse impacts cannot be avoided, site or species-specific mitigation and compensation measures have been adopted to reduce long-term effects on species and habitats. Key mitigative biodiversity strategies that have been implemented, or will be implemented, include the following:

- Replacement of lost habitats along the route, which is predicted to create an overall net increase in habitats. Phase One expects to support 33 square kilometres of new and existing wildlife habitat - an increase of around 30 per cent compared to what is there now.
- Deployment of site or species-specific mitigation and compensation measures to address the effects on species and habitats. For example, 16 "green bridges" will be built along the Phase One route, to maintain safe movement and dispersal of wildlife across the railway.
- Avoidance of ancient woodland sites along the route as much as is possible. There are c. 52,000 ancient woodland sites in England. Of these, a total of 43 will be affected by HS2's route between London and Crewe (Phases One and 2a). Over 80 per cent of the total area of these 43 will remain intact and untouched by HS2.
- Creation of the Phase One Woodland Fund (£5m) to mitigate the loss of ancient woodland sites along the route. This is in addition to the standard mitigation being put in place by HS2 Ltd, such as the planting of seven million trees along the route. The initial £1.2m allocation is anticipated to provide approximately 103 ha of woodland creation and 63 ha of Plantation Ancient Woodlands (PAWS) restoration. In addition, applications currently underway total a further £1.04m, and could represent up to a further 88 ha of woodland creation and 112 ha of PAWS restoration. A Phase 2a Woodland Trust fund of £2m has been committed to be available post Royal Ascent of the Phase 2a Bill.
- All of these initiatives form part of HS2 Ltd's 'green corridor' strategy, and HS2 Ltd continues to work with Natural England and the Environment Agency to further reduce its environmental impact and maximise the opportunities for environmental benefits that the project presents.

1.106 It is important to note that environmental mitigations often require decisions about balancing competing environmental issues. For example, as set out in the Phase One Environmental Statement, a third of HS2's 60-year residual carbon footprint is as a result of construction impact of tunnelling. This, itself, has been specified to mitigate surface environmental impact, particularly in areas such as the Chilterns.

1.107 HS2 may also play a key strategic role in climate change adaptation. With extreme weather events becoming more frequent, existing transport networks are ill-prepared for high winds, intense rainfall and increased frequency of major

storms. HS2 has been designed with these in mind, and can be expected to maintain performance under more extreme weather conditions.

Wider economic case

1.108 The Government has clearly set out its firm focus on rebalancing the economy and creating jobs, skills and talent to raise the level of productivity across the UK. HS2 is essential to delivering these wider ambitions.

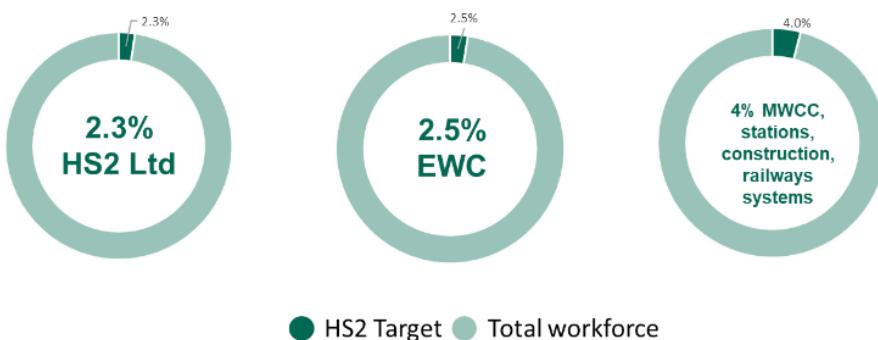
1.109 HS2 is a transformational project, forming the backbone of Britain's future rail network, and is expected to have impacts that are more widely felt than the current appraisal framework used for transport investments is able to monetise. The levelling-up and decarbonisation benefits of the scheme are just two elements of this wider case. This chapter sets out the Government's latest arguments and evidence for the wider benefits of HS2.

HS2 will be a catalyst for job creation

1.110 HS2 will create opportunities for skills and employment with demand for construction and labour skills creating up to 30,000 jobs, including up to 2,000 new apprenticeships. So far, more than 9,000 people already work on the programme including over 320 apprentices.

1.111 The Department's aim is for greater availability and take-up of apprenticeships in the construction and operation of HS2. HS2 Ltd has been set a target for the number of apprenticeships relative to workforce numbers.

Figure 1.13: Target for number of apprenticeships in the construction and operation of HS2



Source: Department for Transport

1.112 The Government will also ensure that HS2 will leave a legacy of skills and talent in the UK construction and engineering industries. For example, it is:

- Delivering several skills, employment and education (SEE) initiatives along the HS2 route, such as new apprenticeships, local jobs, jobs for unemployed, work placement and school engagements.
- Ensuring HS2 Ltd supply chain apprentices will be employed in the industry beyond their apprenticeship.

- Ensuring HS2 Ltd will deliver an outreach programme to promote skills and career development associated with high speed rail, targeting both secondary and further education.

Figure 1.14: Estimates for number of jobs supported by HS2

Greater Manchester Combined Authority estimates that up to 180,000 new jobs will be created by 2040.	The Lancashire Enterprise Partnership estimates 3,000 additional jobs in Preston and South Ribble.	Darlington Borough Council estimates over 3,000 new jobs to the Tees Valley City Region.
The West Yorkshire Combined Authority estimates 40,000 jobs could be created.	The East Midlands HS2 Growth Strategy estimates that HS2 could bring 74,000 new jobs.	The Constellation Partnership predicts HS2 will help the creation of 120,000 new jobs across the region.
The West Midlands Combined Authority estimates HS2 could support over 100,000 jobs. 		

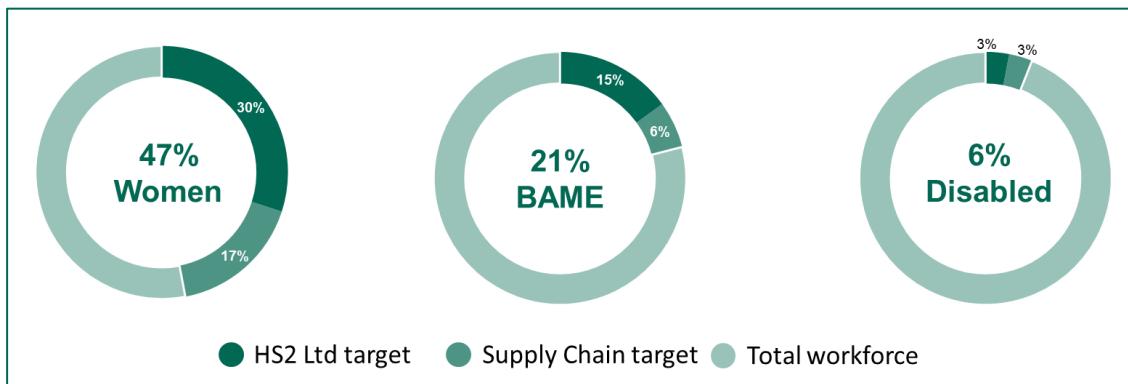
Source: Various

HS2 will boost the business environment in the UK

- 1.113 HS2 has the potential to deliver wider economic growth to the regions of the UK. Key players in the services industries, such as HSBC and Channel 4 have already moved their headquarters to Birmingham and Leeds. In January 2020 BT Group announced it will take occupation of the Three Snow Hill development in Birmingham City Centre, in the largest single office letting in Birmingham securing [a reported 4,000 jobs](#).
- 1.114 HS2 Ltd is also working to increase the participation of small to medium enterprises (SMEs) in the supply chain with a target for 60 per cent of contracts within the supply chain to be awarded to SMEs. Suppliers will be required to advertise sub-contract opportunities to further boost SME accessibility.
- 1.115 Improved connectivity will enable start-up businesses outside London to connect with international investors, venture capitalists and mentors in the capital, giving them the reliability and accessibility they need to develop long term relationships.
- 1.116 HS2 is a critical part of the growth of the UK construction sector over the coming decade, with the Government having set a target for 95 per cent of contracts across the whole HS2 programme to be with UK based businesses. So far, 2,000 UK businesses have already won contracts.
- 1.117 HS2 is also expected to promote diversity in the rail and construction industry with greater availability and take up of jobs within HS2 Ltd and the supply chain for diverse and under-represented people. [Today, just 4.4 per cent of the rail](#)

engineering workforce are women. The targets set for HS2 Ltd and its supply chain achieves or betters an externally verified Equality, Diversity and Inclusion standard for diversity.

Figure 1.15: HS2 targets for diverse and under-represented people in the workforce



Source: Department for Transport

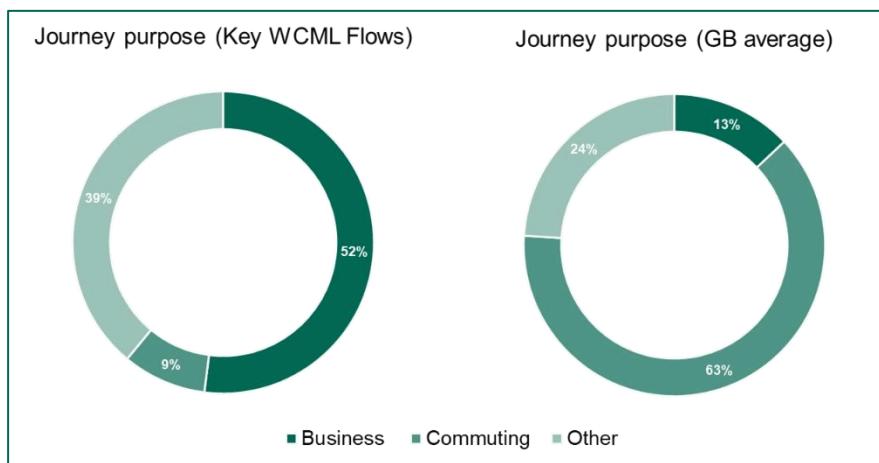
HS2 will leave a legacy of skills

1.118 HS2 is expected to contribute towards the Government's economic rebalancing objectives by improving connections between places that can facilitate trade and specialisation. The benefits of HS2 for business connectivity were set out in the supplement to the 2013 Strategic Case "[HS2 and the Market for Business Travel.](#)"

1.119 Knowledge-based sectors, such as advanced manufacturing, digital and creative and professional and creative services are forecast to grow at a faster rate than other sectors and thereby become an even more important segment of the overall economy. Knowledge based firms thrive in city regions and these sectors typically employ a higher proportion of professional, managerial and technical staff compared to other industries. People in these occupations are more likely to travel by rail than other groups for business, commuting and leisure. Growth in these sectors is therefore expected to lead to an increase in rail travel between city regions.

1.120 HS2 is ideally placed to deliver the inter-city connectivity that is needed to maximise the future success of knowledge-based sectors. While business trips account for just over a tenth of all rail trips across the country, currently almost half of the journeys between the city regions that will be connected by HS2 are for business. The corridors to be served by HS2 are already important for business travel: they include the country's six largest rail inter-city business flows. In 2013/14 it was estimated that 52 per cent of all rail journeys between London and Birmingham, Manchester, Liverpool and Glasgow were business trips, as shown in Figure 1.16 shows that the WCML has a much higher proportion of business trips than the average for the British rail network.

Figure 1.16: summary of journey purpose on WCML vs UK average



Source: National Rail Travel Survey

HS2 is at the forefront of new technology and innovation

1.121 HS2 is one of the UK's most ambitious transport infrastructure projects. Its construction and operation presents a significant opportunity for the railway industry to drive innovation through the supply chain. HS2 Ltd aims to demonstrate an exemplar approach to innovation and has developed a dedicated 'Innovation Strategy'. This strategy focusses on facilitating an increased uptake in innovation across the programme, working directly with the supply chain, the Government and other key external stakeholders. HS2 Ltd's innovation programme has three key objectives:

- To support the creation of capability to enable innovation throughout the lifetime of the railway;
- To create a collaborative culture internally and externally that ensures innovation can thrive; and
- To direct innovation capacity to where it will have the greatest impact.

Specific examples of technological improvements over the existing conventional rail network that HS2 Ltd. is pursuing include:

- Semi-Automatic train operation – where starting and stopping is automated, but a driver operates the doors, drives the train if needed and handles emergencies. Automatic control of stopping and starting will reduce energy consumption in operation and improve capacity and reliability.
- In-cab digital signalling – removing the need for line side equipment, which reduces cost and improves both capacity and reliability.
- Enhanced remote asset condition monitoring using trackside and train-borne equipment – to improve maintenance efficiency and therefore performance and reliability.
- An integrated data platform that combines passenger and operational data for improved customer experience.

Transforming Great Britain's rail infrastructure

- 1.122 Phase One is the first stage of a process to transform Britain's rail network. It will facilitate future rail infrastructure such as Phase 2a and 2b, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH). This is where the real benefits for the North of England will be generated.
- 1.123 The design for HS2 Phase 2b has already been modified to maximise integration with the proposed outputs of NPR and MRH, however the Government will work with HS2 Ltd and local leaders, to draw up an Integrated Rail Plan (IRP) for the Midlands and North, to be published by the end of the year. This work will be informed by an assessment from the National Infrastructure Commission (NIC) looking at the rail needs of the Midlands and the North, and the available evidence on NPR, HS2 Phase 2b, and other proposed rail projects.
- 1.124 Phase One infrastructure accounts for the majority of journey time savings on the HS2 route. Without Phase One it would not be possible to achieve the proposed journey times savings between the economic centres of London, Glasgow and Edinburgh diluting the benefits of the programme for Scotland's major cities.
- 1.125 HS2 infrastructure and services are central to proposals for NPR. In July 2019, the Government agreed to fund a NPR line between Manchester and Leeds. The Government and Transport for the North are continuing to develop the Strategic Outline Business Case for NPR, which is due in the coming months, and seeks to maximise the potential use of HS2 infrastructure. For example, these proposals could make use of c.100km of HS2 infrastructure into Manchester, Leeds and York. NPR junctions with HS2 could also connect major centres, such as Liverpool, with the HS2 network. As such HS2 is integrated into the strategic plans for the development of the rail network.
- 1.126 Should HS2 not be constructed there would be significant additional cost to the proposed NPR routes. The full benefits of NPR are dependent on HS2 Phase 2b, and the scope and integration of the two schemes will be further considered under the Integrated Rail Plan.
- 1.127 In addition, proposals for the Midlands Rail Hub (MRH) are looking at ways to boost East-West capacity and complement HS2 services, addressing the increase in demand for rail travel seen in recent years, fuelled by the growth of the professional services sectors. MRH is not dependent on HS2 happening. However, HS2 is a positive influence on elements of the business case for MRH.
- 1.128 HS2 is not a standalone engineering project and it is designed to be integrated into the country's existing transport system, meaning that not just those places directly served by HS2 will benefit. In Phase One, conventional compatible services will travel onto the existing network to destinations not directly on the HS2 network, such as Stafford, Stoke, Liverpool, Preston, Carlisle and Glasgow. Further destinations will be served once Phase 2b is operational.

2. Economic Case

- 2.1 This Economic Case sets out the latest value-for-money (VfM) assessment for the Phase One programme. It revisits the Economic Case for HS2, and updates it with information obtained during the design and procurement for Phase One. This Economic Case also provides an updated VfM assessment for the full “Y” network.
- 2.2 The Economic Case includes:
- a description of the appraisal framework used to assess the costs, benefits and revenues of HS2 including a description of the changes in the framework since the OBC;
 - an explanation of the current benefit-cost ratios (BCRs) for Phase One and the full “Y” network;
 - an assessment of where Phase One fits within the Department’s wider value-for-money framework; and
 - an exploration of how the Economic Case supports the Strategic Case and recommendations from the Oakervee Review.
- 2.3 The Economic Case draws on advice from HS2 Ltd, who have undertaken the modelling and economic analysis for use by the Department. The economic case has used Q1 2015 prices (2015 prices) and has not been updated to 2019 prices. This allows for easy comparison with the 2017 economic case.
- 2.4 Phase One has been assessed as ‘low’ value-for-money according to the Department’s VfM framework for economic appraisal. However, Phase One is an enabler to the full “Y” network, which has demonstrated ‘low to medium’ value-for-money. Switching values and sensitivities demonstrate that only small changes to the benefits or costs of the full “Y” scheme move the BCR to a medium value-for-money i.e. above 1.5:1.
- 2.5 Departmental guidance sets out three levels of analysis for quantifying the impacts of transport schemes and are differentiated based of the maturity of the techniques. The HS2 economic case quantifies the first two levels associated with transport user benefits and the wider economic impacts, assuming fixed land use. The third level of benefits associated with variable land use are not quantified in this economic case but are explored in the strategic case above.
- 2.6 As a result, while also taking into account the overall capacity, connectivity and wider transformational benefits of HS2 outlined in the strategic case, the benefits of the scheme continue to outweigh the costs, providing long-term economic value for the taxpayer.

2.7 The high-level results of the economic assessment have been provided in Table 2.1 below. The subsequent economic case provides further detailed breakdown of the benefits, costs and revenues.

Table 2.1: Economic analysis of HS2

PV, 2015 prices, £bn	Phase One Only “Parliamentary Powers”	Phase One and 2a “Statement of Intent”	Phase One, 2a and 2b “Full “Y” network”
(1) Net Transport Benefits (Incl. Wider Economic Impacts)	32.8	38.0	94.7
(2) Total Costs	43.3	51.2	108.9
(3) Revenues	15.7	18.4	45.4
(4) Net Costs to Government (2) – (3)	27.6	32.8	63.5
Benefit Cost Ratio (Incl. Wider Economic Impacts) (1) / (4)	1.2	1.2	1.5*
Value-for-Money Category	Low	Low	Low to Medium

*The Full Network BCR (Incl. WEIs) is 1.49 to 2 decimal points

Appraisal framework

Benefits

2.8 A wide range of benefits are quantified in monetary terms, ranging from direct transport user benefits from travel time savings, reductions in crowding and improvements in reliability, to wider economic impacts (WEIs) and environmental impacts such as noise and air quality. There is also a qualitative assessment that assesses non-monetised impacts such as heritage and townscape to inform the VfM decision. Table 2.2 sets out the range of monetised and non-monetised impacts of HS2 that follow Transport Analysis Guidance (TAG) principles.

Table 2.2: Monetised and non-monetised impacts of HS2

Initial BCR: Monetised impacts which are well established	Adjusted BCR: Monetised impacts where the evidence is developing	Monetised impacts not included in the BCR	Non-monetised, qualitative impacts
Travel Time Savings (In-vehicle, walk and wait) Crowding Noise Carbon Impact Accidents Infrastructure Indirect Tax Revenue Reliability Air Quality Access and Egress Operational Revenues	Wider Economic Impacts (WEIs): Agglomeration Labour Supply Impacts Imperfect competition	Landscape	Townscape and Landscape Heritage Biodiversity Water Environment Severance Physical Activity Accessibility Journey Quality Option Values Security

- 2.9 The benefits and revenues are drawn from the PLANET Framework Model (PFM) version 9 which models the changes in travel behaviour brought about by the introduction of HS2 services. It is a peer-reviewed model that provides a strategic view of the rail, road and air markets and draws from information such as ticket sales and other data. PFM assesses the impact of HS2 on the behaviour of existing travellers who may switch to HS2 or make a different trip. It also assesses the extent to which HS2 and the associated capacity released attracts new demand (although the potential for additional services on the existing network, which are made possible by the released capacity, is not reflected in PFM).
- 2.10 Wider economic impacts have been estimated using version 2.0 (beta) of the Wider Impacts in Transport Appraisal (WITA) tool, which has been developed by Atkins on behalf of the Department. This tool estimates the benefit of knowledge sharing through static agglomeration, and benefits from larger labour supply and higher output by businesses.
- 2.11 There are several other wider economic impacts that are not assessed as the techniques to estimate these needs further development. There is also insufficient information on their likely scale. These impacts relate to second order transformational effects that go beyond traditional transport appraisal. These benefits include:
- Higher foreign investment into the UK: The UK becomes a more attractive investment location due to better transport connections;

- Dynamic clustering: Businesses relocate to be closer together forming clusters around well-connected places to benefit from knowledge sharing;
- Workers moving to more productive jobs: In response to changes in transport costs workers move to areas with higher levels of productivity due to a variety of factors such as agglomeration and capital; and
- Induced development: Property developers may react to the transport improvements from HS2 by upgrading housing stock, which could lead to regeneration.

2.12 The Chairman of HS2 Ltd set out in his August 2019 advice to the Department proposals to change the HS2 appraisal methodology. These proposals have not been incorporated within the core benefit-cost ratio or VfM assessment but have been set out in the “Extended BCR” sensitivity below.

2.13 The Oakervee Review sets out that “work is needed by the DfT and HS2 Ltd for future HS2 business cases to review and quantify the level 3 impacts in the benefit-cost ratio given the prominence of these impacts in the strategic case.” The HS2 Ltd Chair agrees with this proposal and it is expected that the Department and HS2 Ltd will work together to develop this for future business cases.

Costs

2.14 The economic assessment includes the expected costs to the Government of the programme which are presented in Net Present Value (NPV) terms. This includes the capital costs of constructing the railway, and the operating costs of running it. The revenue arising from additional rail passengers is deducted from those costs to calculate the net impact to the public sector.

2.15 This assessment relies upon the operating surplus from HS2 services reverting to Government, to offset in part the initial construction costs. To ensure that this is possible under a range of different commercial models for HS2, the Government intends that the HS2 Infrastructure Manager will levy an Investment Recovery charge on all users of HS2 infrastructure. More detail on the Investment Recovery Charge is contained in the Financial Case.

2.16 The capital cost assumptions in the Economic Case for Phase One align with the latest baseline cost estimate produced by HS2 Ltd, supplemented with a contingency provision to reflect the risks and uncertainties associated with the estimates.

2.17 For Phase One the point estimate is £31bn in 2015 prices (£35bn in 2019 prices). The Target Cost agreed between the Department and HS2 Ltd is £36bn (£40bn in 2019 prices) (which represents the point estimate plus £5bn of contingency) at the point of NtP. This has been used as the reference case for the economic case. A sensitivity using the total Funding Envelope of £40bn (£45bn in 2019 prices) has been provided to capture the total government held contingency. The contingency amounts are informed by reference case forecasting (RCF). The Target Cost and Funding Envelope are associated with

50 per cent and 75 per cent respectively of the reference projects based on the remaining cost to go. The rationale for the use of RCF to support assumptions on contingency is provided in the Financial Case. This approach factors in that some risk may have already materialised on the sunk costs of the programme.

- 2.18 The Phase 2 cost estimates used in this appraisal are derived from the latest advice from HS2 Ltd on the likely costs of the current scheme and P-Mean contingency has been applied as per Departmental guidance. Phase 2 is at an earlier stage of design than Phase One and as such the cost estimates are less mature.
- 2.19 Phase 2a costs used have a central cost estimate of £4.4bn, plus 36 per cent contingency (equivalent to P-Mean contingency using RCF). Phase 2b costs use a central cost estimate of £28.7bn plus 36 per cent contingency. Sensitivities applying an RCF P75 level of contingency across all phases have been applied to assess the VfM of the Funding Envelope for the whole scheme. Contingency has been applied on costs to go.
- 2.20 Economic appraisal is conducted based on the costs that will be incurred following the decision to go ahead with HS2. Therefore, spend up to the end of 2019 has been treated as sunk and excluded from the appraisal except for purchase costs on land and property that could be recoverable were HS2 not to go ahead.
- 2.21 The Do Minimum scenario has been updated to include additional estimated costs that would occur were the programme to be cancelled and assumes that 75 per cent of the spend on land and property is recoverable should HS2 not proceed.
- 2.22 For the purposes of appraisal, the capital costs are inflated with construction cost inflation, discounted to present values and converted to market prices. For the central case, the ‘Independent Inflation Experts’ (IIE) construction cost inflation forecasts were applied between 2015/16 and 2018/19, and NERA Economic Consulting’s (NERA) construction inflation forecasts were applied between 2019/20 and 2022/23. Thereafter, construction inflation forecasts were assumed to linearly converge over a four-year period to the average historic real inflation rate (interpreted as a long-term equilibrium towards which HS2 specific real inflation converges in the medium-term; 1.38 per cent above GDP deflator).
- 2.23 Renewal costs capture the ongoing costs of renewing both infrastructure and rolling stock throughout the lifecycle of the scheme. These have been calculated within the capital expenditure model (capex model) but are presented separately.
- 2.24 The operating costs have been estimated using the Baseline Operating Cost Model (BOCM) using ‘Operating Cost Estimate’ (OCE) version 2.1. which draws together detail on the operating characteristics of HS2 and the existing rail network based on knowledge of the cost of operating rail services. The model

considers both the operating costs of running HS2 services as well as the operating cost savings on the conventional network.

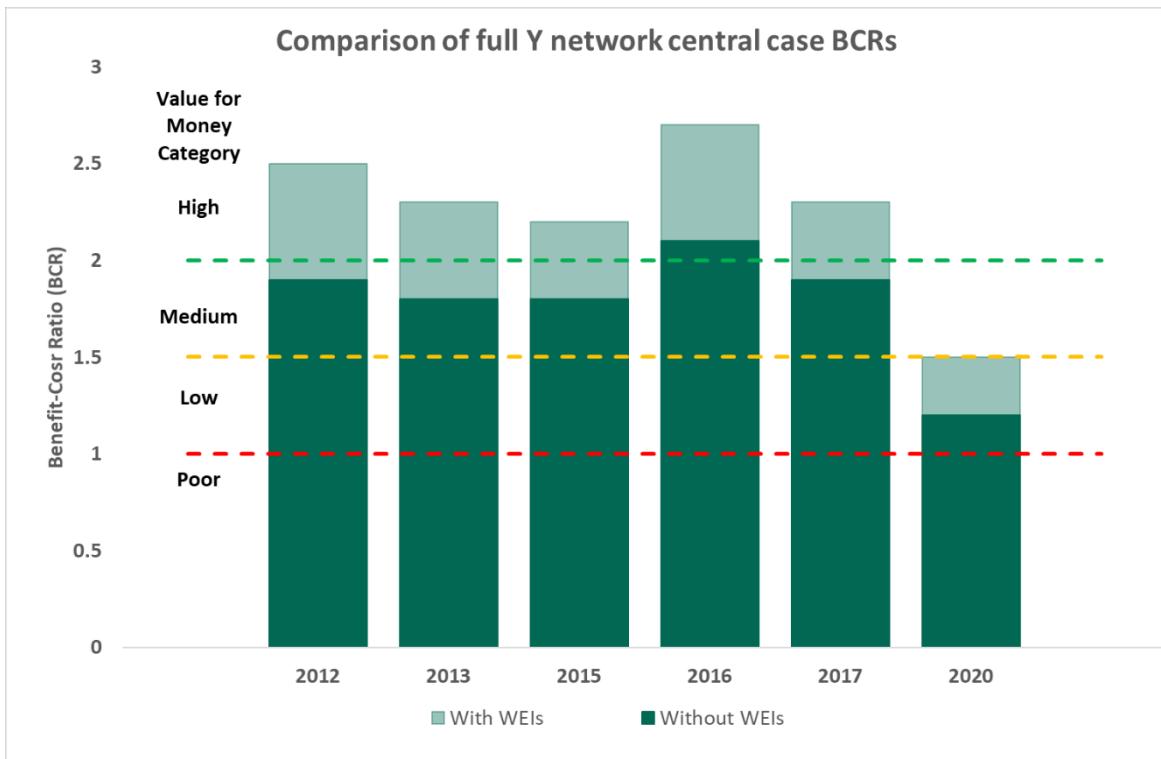
Train Service Specification

- 2.25 This Economic case has been modelled on one potential train service specification (TSS) and assumes Phase One will have a phased opening of 6tph from Old Oak Common from December 2029, followed by 10tph from Euston from December 2031.
- 2.26 The modelling assumption used in this Economic Case does not align with the BL7.1 (3tph from Old Oak Common in 2029-33 and 10tph from Euston in 2031-36). However, the revised baseline schedule (Baseline 7.1) indicates a significant lag in the emerging delivery into service for Euston and Old Oak Common. To optimise use of the core Phase One infrastructure and introduce HS2 services to the North West before the completion of Euston and Phase 2b, a new staged opening strategy with 6tph rather than 3tph has been modelled.
- 2.27 Modelling 6tph from OOC sees an increase in benefits, revenues, operating costs and capital costs of less than one per cent and therefore the impact on the BCR is likely to be negligible. This is because the improved scenario is only providing additional benefits for two years out of the 60-year appraisal period.
- 2.28 Further work is underway on the operational impact of running 6tph from OOC until the commencement of services from Euston. The TSS will continue to be developed as the project progresses towards completion and decisions about service introduction will be made closer to the time drawing on advice from the West Coast Partnership, HS2 Infrastructure Manager and Network Rail.
- 2.29 A sensitivity has been undertaken using dates at the end of the schedule ranges with Old Oak Common opening in 2033 and Euston in 2036.
- 2.30 For Phase One, it is assumed that trains to destinations beyond Birmingham will use Handsacre Junction whereas the Statement of Intent and full “Y” networks assume that all but one of these trains go via Crewe. It is assumed that Phase 2b will come into operation in December 2035 with a 17tph service. Diagrams illustrating the central cases for TSS modelling can be found in Annex B.

Updates to the appraisal framework

- 2.31 Updates have been made since the 2017 Economic Case to improve the modelling and appraisal framework, to ensure that the appraisal of HS2 is using the most up-to-date information and is consistent with the latest Transport Analysis Guidance (TAG). Figure 2.1 demonstrates how the VfM of HS2 has evolved over time.

Figure 2.1: Full “Y” network BCRs over time



2.32 The highlights of the changes since the 2017 Economic Case are described below, alongside the direction of change in the full “Y” network BCR:

- PLANET Framework Model updates: A series of methodological changes and updates to assumptions have been carried out, which now include improved functionality and allowance for a Do-Minimum variable demand response. This is a significant enhancement to the appraisal and modelling of the programme, allowing rail market change due to future year Do-Minimum assumptions to be reflected in the programme. This has a small downward impact on the BCR.
- Operational cost model update: BOCM has replaced the previous operational cost model. The new model predicts a slight decrease in operating costs for the scheme relative to the previous business case.
- Capital cost model update: Updates have been made to the capex model to incorporate refinements to cost baselines across all phases of the programme, which are all a net increase in capex relative to the 2017 Economic Case. This includes accounting for additional sunk costs and increased Do-Minimum costs. Additionally, the index used for construction cost inflation has been updated to reflect the department’s latest view on inflation.
- Conventional rail update: Several conventional rail network assumptions were updated as part of a review of the TSS assumptions. These have had an overall positive impact on the business case.
- High Speed rail update: TSS assumptions have been updated to reflect; the latest staged opening, the decision to serve Stoke (assuming a London-Preston and

London-Liverpool service join at Euston) and the London-Scotland Service split/join at Carlisle rather than Carstairs. These updates have had an overall positive impact on the business case.

- Wider Economic Impacts: Updates have been made to Wider Impacts in Transport Appraisal (WITA) tool moving to v2.0 (beta) this has included using the latest NTEM forecasts, which forecasts higher employment and productivity growth. This has had a positive impact on the business case.
- For the purposes of economic modelling the schedule opening dates for Phase One, 2a and 2b have all been updated as follows: Phase One is now scheduled to open with 6tph from Old Oak Common in 2029 and the full 10tph from Euston in 2031. Phase 2a is scheduled to open in 2029, Phase 2b with the full 17tph in 2035. The change in opening assumptions has caused a slight reduction in modelled benefits and revenues.
- Forecast demand change; demand forecasts are lower compared to the 2017 Economic Case. The forecasting framework has been updated in line with TAG and reflects evidence from the Rail Demand Forecasting Estimation study supported by the Department. The current central assessment includes a Generalised Journey Times (GJT) trend for 13 years from the start of the appraisal.
- PfMv9 adopted a new Reliability methodology adding onto each classic service a value of delay calculated as delay per km multiplied by the distance travelled. The delay per km is Train Operating Company (TOC) specific and is based on historic data over the last 10 years.
- Economic appraisal update: the assessment above relies on the following:
 - Latest TAG databook (May 2019), which has updated GDP deflator and annual GDP growth forecasts reflecting updates by OBR. These are used to forecast growth in values of time, from which benefits are calculated. The databook also includes revised population growth rates.
 - As per the 2017 Economic Case benefits and revenues, for the full “Y” network, have been extrapolated in line with population projections, replacing the “demand cap”.
 - Other appraisal updates include changing the discount year from 2017 to 2019 and the final forecast year to 2039, in line with TAG Rail Appraisal guidance.
 - Costs incurred prior, up-to, and including December 2019 have not been included within the economic appraisal as they are sunk (except for some costs relating to Land and Property which may be redeemable).

The case for HS2

Reference Case assumptions

2.33 The economic appraisal has three different reference cases for the construction and operation of HS2 based on which phases of the network are built. The Parliamentary Powers case assumes that only Phase One infrastructure is built

and operated. This is the infrastructure that the Government currently has powers to build.

2.34 The Statement of Intent case assumes both Phase One and 2a infrastructure will be built and operated in an integrated way, reflecting the Government's intention for both phases to be open and running services at the same time, subject to approval by Parliament. The full "Y" network assumes that all three phases of HS2 are built in line with current designs and that Phase 2b comes into operation in 2035.

Assessment of Parliamentary Powers (Phase One only)

2.35 The Parliamentary Powers case assumes 6tph from Old Oak Common to Birmingham and the North West (via Handsacre Junction) in 2029. From 2031, 10tph are assumed to operate from Euston to Birmingham and the North West (via Handsacre Junction).

2.36 The benefits, revenues and costs of Phase One only are presented in Table 2.3 below. Phase One in isolation is expected to generate benefits totalling £32.8bn (PV, 2015 prices).

Table 2.3: Benefit Cost Ratio (BCR) components of Parliamentary Powers Network

	Parliamentary Powers	PV, 2015 prices, £bn
1	Net transport benefits	26.2
2	Wider Economic Impacts (WEIs)	6.6
3	Net benefits including WEIs	32.8
4	Capital costs	32.7
5	Renewals	2.6
6	Operating costs	8.0
7	Total costs = (4) + (5) + (6)	43.3
8	Revenues	15.7
9	Net costs to Government = (7) – (8)	27.6
10	BCR without WEIs (ratio) = (1) / (9)	1.0
11	BCR with WEIs (ratio) = (3) / (9)	1.2

2.37 The key driver of benefits in Phase One are the transport user benefits that derive from the improved connectivity that the new high-speed network will deliver. The detailed breakdown of benefits can be found in figure 2.12.

2.38 The wider economic impacts for Phase One account for around £6.6bn of benefits. These benefits can be mainly attributed to agglomeration.

Robustness of the assessment

2.39 The results provided above are based on a central estimate. The following section provides sensitivities on key assumptions on cost, demand and opening

dates. These sensitivities are tested against the central Parliamentary Powers case and show the relative robustness of the assessment for the Parliamentary Powers case.

Table 2.4: Sensitivities against Parliamentary Powers Case

Sensitivity	Description	BCR impact	
		Without WEI	With WEI
Reference Case		1.0	1.2
Increased Costs	Capital costs at the Funding Envelope of £40bn	0.8	1.0
High Demand	Demand is 16 per cent greater than in the reference case	1.3	1.6
Low Demand	Demand is 16 per cent less than in the reference case	0.7	0.9
Single Forecast year	Single forecast year in 2029	0.8	1.0
Third Forecast year	Third forecast year in 2049	1.1	1.4
No Reliability	Reliability benefits are excluded from the results	0.8	0.9
Residual Value	100 year appraisal period from scheme opening	1.4	1.8
Schedule	Old Oak Common opening 2033; Euston Opening 2036.	0.9	1.1

2.40 The range of sensitivities represent both upside and downside risks to the appraisal assumptions used in Phase One analysis. The upside sensitivities of higher base demand and a third modelled year in 2049 strengthen the case for Phase One whereas the downside sensitivities can push the BCR below one.

2.41 When using the Funding Envelope, which encompasses the risk held by Government, as the total costs of constructing HS2 the BCR falls to 1.0 with WEIs, meaning that the Parliamentary Powers case remains low value-for-money.

2.42 The demand sensitivities are presented to demonstrate how changes to the benefits and revenues of the project can alter the value-for-money of the project. Sixteen per cent was chosen as it represents the range in demand sensitivities presented in previous HS2 economic cases through sensitivities such as GDP

growth or fare policy. The results show that the BCR for Phase One can move into different VfM categories with a change in assumptions.

- 2.43 PFM is a model which is underpinned by exogenous elasticities. In line with TAG, it therefore models the second forecast year twenty years from the start of the appraisal period. Sensitivity tests with a final forecast year of ten and thirty years after the appraisal year have been undertaken. These sensitivities test the impact of changing the period over which the exogenous relationships are assumed to hold to establish the potential impacts on costs, benefits and revenues. These sensitivities demonstrate that a third forecast year increases the BCR with WEIs increases to 1.4 whereas using a single forecast year in 2029 reduces the BCR with WEIs to 1.0.
- 2.44 The ‘no reliability’ assumption tests the case for HS2 if you assume it does not deliver any reliability benefits beyond those achieved by the conventional network. When this sensitivity is undertaken the BCR with WEIs falls to 0.9 and without WEIs to 0.8. This is driven by greater disbenefits associated with longer wait times and delayed journeys.
- 2.45 The residual value sensitivity captures the benefits and revenues that occur from HS2 after the end of the 60-year appraisal period that TAG states transport investments projects should use. By assessing the benefits, revenues and operating costs over 100 years they are closer aligned to the design life of 120 years. Inclusion of the residual value sensitivities increases the BCR to 1.8 when including WEIs which pushes the value-for-money into Medium.
- 2.46 The opening dates assumed in the reference case capture the beginning of the Delivery-in-Service (DIS) ranges that HS2 Ltd have advised the department on. The schedule sensitivity assumes Old Oak common opens in 2033 and Euston station opens in 2036 to capture the end of the DIS ranges. Moving the opening of Old Oak Common and Euston stations causes the BCR to fall by 0.1 due to benefits occurring further into the future.
- 2.47 Switch value analysis is useful to test uncertainty around working assumptions, known to significantly drive benefits and revenues of HS2, such as reliability and train service assumptions (i.e. the scope the infrastructure intends to deliver). Table 2.5 summarises the change in benefits and costs required to alter the value-for-money assessment for Parliamentary Power with WEIs.

Table 2.5: Switch value analysis

PV, 2015 prices	Change in Value-for-Money Category With Wider Economic Impacts	Change to Parliamentary Powers
Decrease in net transport benefits including Wider Economic Impacts	Poor	- £5.3bn (-16%)

Increase in Total costs (capital, operating and renewal costs)	Poor	+ £5.3bn (+12%)
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2.48 Several working assumptions affect both benefits and revenues. They include, relationships between demand and various exogenous factors such as GDP, population and employment. They also include policy assumptions such as the train services the new railway is expected to deliver. From the switch value analysis, we can infer, assuming the scheme is delivered to Funding Envelope, with either a change in the scope of train services delivered or in some exogenous variables that impact demand. A decrease in net transport user benefits including wider economic impacts of 16% (£5.3bn PV, 2015 prices), would decrease the value-for-money category from low to poor. An increase in total costs (capital, renewals and operating costs) of 12% (£5.3bn PV, 2015 prices) would also lead to a fall in the value-for-money category to poor.

Assessment of Statement of Intent (Phase One and 2a)

- 2.49 The Statement of Intent case introduces Phase 2a infrastructure to the high-speed network. This assumes 6tph from Old Oak Common to Birmingham and the North West (via Crewe) in 2029. From 2031, 10tph are assumed to operate from Euston to Birmingham (3tph) and the North West (6tph via Crewe, 1tph via Handsacre Junction).
- 2.50 The costs, benefits and revenues for the Statement of Intent are presented in Table 2.6 below. Both Phase One and 2a are estimated to generate benefits totalling £38.0bn (PV, 2015 prices).

Table 2.6: Benefit Cost Ratio (BCR) components of Statement of Intent Network

	PV, 2015 prices, £bn	Statement of Intent
1	Net transport benefits	30.3
2	Wider Economic Impacts (WEIs)	7.7
3	Net benefits including WEIs	38.0
4	Capital costs	39.4
5	Renewals	3.0
6	Operating costs	8.8
7	Total costs = (4) + (5) + (6)	51.2
8	Revenues	18.4
9	Net costs to Government = (7) – (8)	32.8
10	BCR without WEIs (ratio) = (1) / (9)	0.9
11	BCR with WEIs (ratio) = (3) / (9)	1.2

- 2.51 The Statement of Intent case adds additional capital costs to the scheme through the introduction of the Crewe Hub and infrastructure associated with

this. However, this is counteracted by the additional benefits Phase 2a brings through improved connectivity. As with the Parliamentary Powers case the main driver of benefits are the net transport benefits for business passengers. Detailed breakdown of the benefits can be found in figure 2.12.

2.52 As with Phase One the main driver of WEIs are the agglomeration benefits. The total benefits from the WEIs of Phase One and 2a are estimated to be around £7.7bn.

Robustness of the assessment against the Statement of Intent

2.53 The results provided above are based on a central estimate. The following section provides sensitivities on key assumptions such as demand and appraisal periods. The sensitivities are compared against the core statement of intent case.

Table 2.7: Sensitivities against Statement of intent

Sensitivity	Description	BCR impact	
		Without WEI	With WEI
Reference case		0.9	1.2
Cost	Higher capital costs for Phase One and 2a.	0.8	1.0
High Demand	Demand is 16 per cent greater than in the reference case	1.2	1.5
Low Demand	Demand is 16 per cent lower than in the reference case	0.7	0.9
Single Forecast year	Single forecast year in 2029	0.8	1.0
Third Forecast year	Third forecast year in 2049	1.1	1.3
No Reliability	No reliability benefits included	0.7	0.9
Residual Value	100 year appraisal period from scheme opening	1.4	1.7

2.54 The rationale and results of the sensitivities in the Statement of Intent case follow a similar pattern to the Parliamentary Powers case. The upside sensitivities of greater demand growth and extending the demand cap strengthen the case for HS2 and the downside sensitivities can push the BCR below one.

2.55 Assuming both Phase One and Phase 2a are delivered at high cost the BCR for the Statement of Intent falls to 1.0. This sensitivity assumes that Phase one is delivered at its Funding Envelope (£40bn, 2015 prices) and Phase 2a is delivered with a point estimate of £4.4bn plus a RCF-75 level of contingency (55%).

2.56 The sensitivities on demand mimic the results in the Parliamentary Powers case, with lower demand pushing the BCR with WEIs below one to 0.9 and higher demand increasing to 1.5. A single forecast year in 2029 has a BCR with WEIs of 1.0 and a third forecast year in 2049 has one of 1.3. Removing the reliability benefits reduces the BCR with WEIs to 0.9.

2.57 Once again, increasing the appraisal period from 60 to 100 years improves the BCR with WEIs to 1.7 as 40 additional years of benefits, operating costs and renewals are included within the appraisal.

2.58 Table 2.8 summarises the change in benefits and costs that are required to alter the value-for-money assessment of the Statement of Intent case (when including WEIs).

Table 2.8: Switch value analysis

(PV, 2015 prices)	Change in Value-for-Money Category (with WEIs)	Change to Statement of Intent
Decrease in net transport benefits including Wider Economic Impacts	Poor	- £5.2bn (-14%)
Increase in Total costs (capital, operating and renewal costs)	Poor	+ £5.2bn (+10%)

2.59 A decrease in net transport user benefits including wider economic impacts of 14 per cent (£5.2bn PV, 2015 prices), would decrease the value-for-money category from low to poor. An increase in total costs (capital, renewals and operating costs) of 10 per cent (£5.2bn PV, 2015 prices) would also lead to a fall in the value-for-money category to poor.

Assessment of the Full Network (Phases One, 2a and 2b)

2.60 The full “Y” network adds the Phase 2b infrastructure from Crewe to Manchester and from the West Midlands to Leeds. This case assumes 17tph are operated from 2035 with Phase One and 2a services being available from Old Oak Common in 2029 and Euston in 2031. The full “Y” network brings significant benefits of £94.7bn over the appraisal period (PV, 2015 prices).

Table 2.9: Benefit Cost Ratio (BCR) components of the full “Y” network

	PV, 2015 prices, £bn	Full network
1	Net transport benefits	74.2
2	Wider Economic Impacts (WEIs)	20.5
3	Net benefits including WEIs	94.7
4	Capital costs	78.2
5	Renewals	5.4
6	Operating costs	25.2
7	Total costs = (4) + (5) + (6)	108.9
8	Revenues	45.4
9	Net costs to Government = (7) – (8)	63.5
10	BCR without WEIs (ratio) = (1) / (9)	1.2
11	BCR with WEIs (ratio) = (3) / (9)	1.5*

*The Full Network BCR (Incl. WEIs) is 1.49 to 2 decimal points

2.61 The introduction of Phase 2b infrastructure on top of the Statement of Intent case adds additional capital costs to the scheme. There is also a significant increase in the operating costs when moving from running 10tph to 17tph.

2.62 There are significant increases in the benefits associated with HS2 as the improved connectivity and capacity from the additional services results in greater user benefits. The additional passengers also lead to a substantial increase in net rail revenue. A further breakdown of the benefits can be found in Table 2.12.

2.63 There is also a significant increase in the WEIs associated with the scheme as these are estimated to be £20.5bn for the full “Y” network.

Robustness of the assessment against Full “Y” Network

2.64 The results provided above are based on a central estimate. The following section provides sensitivities on key assumptions such as demand and appraisal periods. The sensitivities are compared against the core full “Y” network case.

Table 2.10: Sensitivities against full “Y” network

Sensitivity	Description	BCR impact	
		Without WEI	With WEI
Reference case		1.2	1.5
Cost	Higher capital costs for Phase One, 2a and 2b	1.0	1.3
High Demand	Demand is 16 per cent greater than in the reference case	1.7	2.1

Low Demand	Demand is 16 per cent lower than in the reference case	0.8	1.1
Single Forecast year	Single forecast year in 2029	0.9	1.1
Third Forecast year	Third forecast year in 2049	1.4	1.8
No Reliability	No reliability benefits included	0.9	1.1
Residual Value	100-year appraisal period from scheme opening	1.6	2.1
Extended BCR	Inclusion of Third forecast year and residual value	2.0	2.6

- 2.65 The sensitivities around the full “Y” network can have a switching value effect on the BCR for HS2.
- 2.66 If you assume that Phase One, 2a and 2b are all delivered at higher cost the BCR for the full “Y” network falls to 1.3 including WEIs. This sensitivity assumes that Phase one is delivered at its Funding Envelope (£40bn, 2015 prices) and Phase 2a and 2b are delivered with contingency equivalent to the RCF75 level (55% contingency).
- 2.67 The lower demand sensitivity reduces the BCR with WEIs to 1.1 and higher demand increases it to 2.1 (high value-for-money). A single forecast year in 2029 has a BCR with WEIs of 1.1 and a third forecast year in 2049 has one of 1.8, moving HS2 to medium value-for-money. Removing the reliability benefits reduces the BCR with WEIs to 1.1.
- 2.68 Once again, increasing the appraisal period from 60 to 100 years improves the BCR with WEIs to 2.1 as 40 additional years of benefits, operating costs and renewals are included within the appraisal. If the third forecast year and 100-year appraisal are modelled simultaneously the BCR for the full “Y” network increases to 2.6. This is explored in more detail in the ‘Chairman’s stocktake’ section below (paragraphs 2.75 to 2.76).
- 2.69 Table 2.11 summarises the decrease in benefits and the scale of a simultaneous, but equivalent increase in both benefits and revenues required to alter the value-for-money assessment for Parliamentary Power with WEIs.

Table 2.11: Switch value analysis

(PV, 2015 prices)	Change in Value-for-Money Category with Wider Economic Impacts	Full "Y" Network
Increase in net transport benefits including Wider Economic Impacts	Medium	+0.6bn (+1%)
Decrease in Total costs (capital, operating and renewal costs)	Medium	-0.4bn (-0.4%)

2.70 An increase in net transport user benefits of one per cent (£0.6bn PV, 2015 prices), would increase the value-for-money category from low to medium. A decrease in total costs (capital, renewals and operating costs) of 0.4 per cent (£0.4bn PV, 2015 prices) would also lead to an increase in the value-for-money category to medium.

Breakdown of the Benefits of HS2

2.71 Figure 2.12 below sets out the detailed breakdown of benefits for each of the three HS2 reference cases described above.

Table 2.12: Breakdown of benefits for the three HS2 reference cases.

Grouped Benefit	Disaggregated benefit	Benefit value (PV, 2015 prices, £m)		
		Parliamentary Powers	Statement of Intent	Full "Y" Network
Transport user benefits	Improved access	620	630	700
Transport user benefits	Reduction in crowding	5,120	5,140	13,470
Transport user benefits	Improvements in interchange	250	180	2,770
Transport user benefits	Reduction in waiting	3,200	3,320	8,920
Transport user benefits	Reduction in walking	20	40	- 120
Transport user benefits	Reduction in train journey times	13,900	17,680	39,070
Transport user benefits	Greater reliability	4,000	4,350	11,850
Transport user benefits	Benefits to road users	210	220	820

Transport user benefits	Total	27,310	31,560	77,490
Other Impacts	Reduction of car noise	10	10	40
Other Impacts	Carbon	150	160	280
Other Impacts	Reduction in car accidents	160	180	550
Other Impacts	Noise from HS2 trains	- 30	- 30	- 70
Other Impacts	Infrastructure	10	10	20
Other Impacts	Total	300	330	810
Indirect Tax	Loss to Government of Indirect tax	- 1,390	- 1,610	- 4,140
Net Transport Benefits		26,230	30,270	74,170
Wider economic impacts	Agglomeration	4,070	4,780	13,670
Wider Economic impacts	Imperfect competition	2,190	2,540	5,990
Wider Economic impacts	Increased labour force participation	360	420	830
Wider Economic impacts	Total	6,620	7,740	20,500
Net Benefits including Wider Economic Impacts		32,850	38,010	94,660

Aligning with the strategic goals of HS2

2.72 The economic case provides an assessment of the economic costs and benefits of the scheme how the impact of delivering the strategic objectives can be expected to have on wider society.

2.73 HS2 will add significant capacity to the UK rail network as the existing network cannot cope with the historic and forecasted growth in the demand for rail travel. These benefits are assessed through the additional services anticipated to run on the HS2 and conventional network compared to a case where HS2 is not built. The Economic Case has not optimised the released capacity in its analysis, which suggests that the benefits of released capacity are likely to be higher than set out in the analysis.

2.74 HS2 will also improve connectivity between Britain's major cities to support balanced growth. The economic benefits of improved connectivity are assessed

through the value of improving journey times between London, the Midlands and the city regions of the North.

2.75 Improved connectivity and capacity can act as a catalyst for wider economic growth supporting more balanced, lasting economic growth HS2 has the potential to generate significant benefits for the real economy by bringing firms and people closer together to:

- Share knowledge and best-practice ('agglomeration benefits');
- Reduce transport and production costs ('business user benefits') and increased output in markets with imperfect competition; and
- Improve access to jobs and encourage labour market participation.

2.76 Phase One has the potential to unlock growth and regeneration across the UK and this will increase significantly when Phases 2a and 2b complete the full "Y" network is complete.

2.77 The economic case demonstrates that the benefits of modal shift from road and aviation to rail leads to a reduction in carbon emissions of £280m (PV, 2015 prices). The impact of emissions during construction are not explicitly quantified within the economic case as, in line with departmental guidance, the social cost of emissions related to the production of materials used in infrastructure should already be internalised within the costs as those emissions are traded⁴. The economic case doesn't consider any biodiversity changes affecting species and habitats along the route.

Chairman's Stocktake and Oakervee Review

2.78 The Chairman of HS2 Ltd set out in his advice to the Government that he considered that the Department's approach to the appraisal of transport investment schemes does not fully account for the transformational benefits of HS2. As set out in that report, his Executive Team advised the Department on modifications to the appraisal framework to ensure that the Economic Case adequately captures the economic impacts. The material changes are set out below (these values have been set out as sensitivities in the previous section):

- Extension of passenger demand forecasts – HS2 passenger demand forecasts are capped to the rate of population growth from 20 years after the start of the appraisal period, in line with the Departmental TAG. This results in the cap applying from 2039/40, shortly after the full "Y" network is operational. Whilst the demand cap reflects that the future is inherently uncertain, evidence suggests that demand growth is highly likely to exceed four years and to assume otherwise would fail to capture the effect that Phase 2b will have on the demand for rail travel. Thus, the application of a much lower growth rate from 2039/40 reduces the benefits and revenues captured in the Economic Case. Extending the demand forecasting period for an extra 10 years will allow for more demand on Phase 2b with passengers benefiting from the faster, more frequent, more reliable and less crowded services. This approach forecasts demand growth of 0.6 per cent per

annum (itself a conservative estimate) above population growth for the 10 years to 2049.

- Extension of the economic appraisal period - in line with HMT Green Book guidance that residual value should be included in the calculations. HS2 is currently appraised over a standard Departmental TAG 60-year appraisal period although it is expected to be operational for considerably longer. The country's existing rail network was first developed by the Victorians and continues to be used today. Indeed, HS2 Ltd is required to design the infrastructure for a 120-year design life. The 100-year appraisal period sensitivity acts as an extension to the existing methodology capturing additional years of transport user benefits and wider economic impacts of the scheme.

2.79 The extensions to the appraisal provides useful evidence to supplement the existing Economic Case. As such, the Department has presented these impacts as a sensitivity, recognising that these outcomes represent a plausible assessment of benefits in line with HMT Green Book guidance. However, these adjustments have not been incorporated into the Phase 1 reference case to ensure consistency with standard Departmental TAG approach and the treatment of transport investment projects.

2.80 The Oakervee Review set out several conclusions relating to the Economic assessment of HS2. It set out that the previously published evidence on HS2 "has considered the impacts of the full HS2 network in line with the HM Treasury Green Book and DfT's Transport Appraisal Guidance (TAG)". However, it also states that there are "wider economic impacts that have not been quantified in the business case". These wider economic impacts mainly relate to Economic rebalancing, a primary driver of the strategic case for HS2.

2.81 Given the complexity and uncertainty inherent in forecasting land-use changes, the benefits of land-use changes have not been included in the BCR estimates for HS2. The Government's [latest Areas of Research Interest published in May 2019](#) demonstrates that the Department and HS2 Ltd are committed to maintaining confidence in the HS2 evidence base and improving the way in which it captures and articulates the transformational impacts of HS2. The Department are working closely with HS2 Ltd to develop tools to help estimate the longer-term transformational impacts of HS2 on the UK economy, which allow people and businesses to relocate in response to transport investment.

2.82 The Oakervee Review also explores the further impacts that have been identified and qualitatively assessed. These include the environmental and social impacts, and benefits beyond the 60-year appraisal period. This business case includes a sensitivity appraising HS2 over 100 years and continues to explore the non-monetised impacts in the value-for-money section below.

GDP impacts

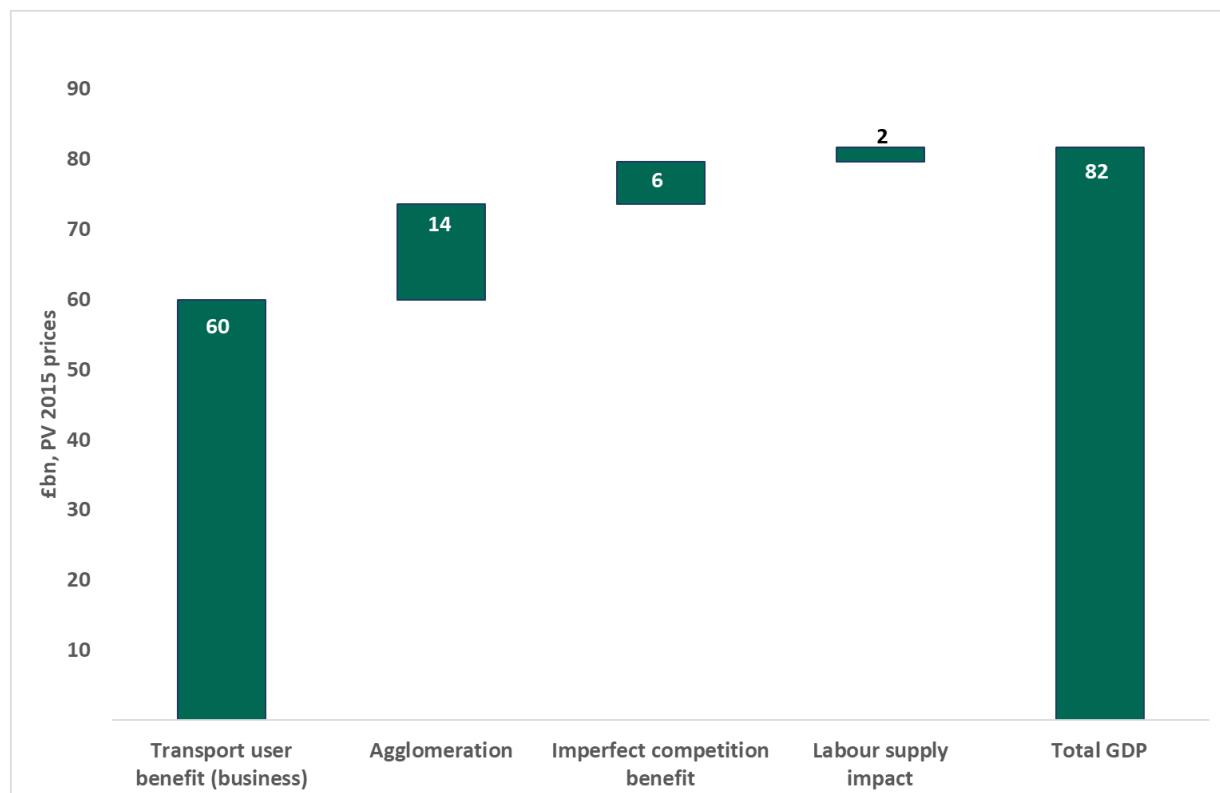
2.83 In line with the Green Book, the Department's TAG captures the welfare impacts of HS2, GDP is not substitutable for welfare analysis as not all opportunity costs

are reflected in GDP as is only a partial measure of the full economic impact. TAG Unit A2.1 sets out an approach where welfare estimates can be transformed into GDP changes. This has been estimated by summing together business user, agglomeration, imperfect competition and labour supply benefits. The labour supply impact on GDP is estimated as 2.5 times the welfare labour supply impact.

2.84 Using this approach, it is estimated that the full “Y” Network could generate £82bn of GDP over the appraisal period to 2095. In other words, around 86 per cent of the benefits assessed in the Economic Case are expected to translate into the real economy. Phase One in isolation is estimated to generate £28bn in GDP benefits and Phase One and 2a are estimated to generate £34bn over the appraisal period.

2.85 Figure 2.2 shows the contribution of the different components of the GDP impact for the full “Y” network.

Figure 2.2: Estimated GDP impacts of HS2



2.86 [The Transport Investment and Economic Performance report \(October 2014\)](#) states that methodologies for estimating the impact of transport schemes on productivity need to be context-specific and that there is no single correct encompassing method. In the context of HS2, the approach to estimating GDP impacts in the guidance does not capture the full transformational economic impacts of HS2 on the economy.

2.87 This approach does not account for changes in spatial patterns of economic activity as businesses and people cluster in areas with improved transport

connectivity and the potential economic gains from regeneration along the HS2 route.

Value-for-money

How value-for-money is determined

- 2.88 The role of the Economic Case at the FBC stage is to present and record the results of the procurement to construct Phase One. For this business case the latest estimates for costs for Phase One, 2a and 2b have been used alongside the latest modelling for benefits and revenues.
- 2.89 The Economic Case needs to reach a conclusion as to whether the HS2 programme represents value for taxpayers' money. The analysis presented here quantifies the economic impacts of Phase One under the three reference cases against a "without scheme" scenario, to assess the economic, social, environmental and public accounts impact of the transport intervention. The quantified analysis of the impacts forms the basis of any VfM assessment of the scheme proposed.
- 2.90 There are limits on the ability of a single BCR to generate conclusions on the VfM of the programme. The role of the sensitivities undertaken present how uncertainty over long-term demand forecasting, schedule uncertainty and costs of the programme, effect value-for-money.
- 2.91 To compare across schemes, TAG specifies value-for-money categories within which schemes can be placed. Table 2.13 below presents these categories.

Table 2.13: value-for-money categories

VfM Category	BCR
Poor	Less than 1.0
Low	Between 1.0 and 1.5
Medium	Between 1.5 and 2.0
High	Between 2.0 and 4.0
Very High	Greater than 4.0

- 2.92 The results show that Phase One in isolation has a central BCR of 1.2, including wider economic impacts (WEIs) and 1.0 excluding WEIs. This indicates that the scheme on a standalone basis is designated "low" value-for-money by the Department.
- 2.93 However, it is important to recognise that Phase One is not a standalone project. Alongside Phase 2a it is an enabler to a series of national transport investments such as Phase 2b, Northern Powerhouse Rail and Midlands Rail Hub. The Statement of Intent, which includes Phase One and Phase 2a infrastructure has a central BCR of 1.2, including WEIs and 0.9 excluding WEIs. Integrated together Phase One and Phase 2a is designated "low" value-for-money by the Department.

- 2.94 The full “Y” network, which comprises all three phases delivers “low to medium” value-for-money with a central BCR of 1.5, including WEIs and 1.2 excluding WEIs.
- 2.95 The sensitivity tests set out this economic case show that the BCR for all three reference cases can switch between different VfM categories depending on the assumptions used.
- 2.96 There is uncertainty facing some of the factors that could worsen the VfM of the programme, but there are also reasons to believe the current assessment is conservative in its approach. The demand growth forecasts are lower than recent trends and extending the demand cap demonstrates a positive impact on the BCR. No assumptions are made on land use change resulting from improvements in connectivity of HS2 which could make businesses alter their location. There could be further benefits from regeneration and moving to more productive jobs that are not accounted for in this assessment. Finally, there are several benefits which have not been included in the VfM assessment, for example improvements to the environment and the skills legacy.

Non-monetised assessment

2.97 In line with TAG, a qualitative assessment has been made of additional Phase One impacts which cannot be monetised. Since 2013, there have been several minor changes to the route outline in several additional provisions (APs) and accompanying supplementary environmental statements (SES). These have been used to reassess the original non-monetised assessment, to see if there is a case for the original assessment to be changed. The results are outlined in Table 2.14 below.

Table 2.14: Non-monetised impacts

Impact	Assessment	Comments
Landscape	Moderate adverse	This scheme requires significant land acquisition and part of the route passes through the Chilterns AONB.
Townscape	Neutral	Unknown impact on key urban areas; potential for new stations to improve townscape but there is also some loss of buildings/parks of value.
Heritage	Moderate adverse	Impact on one scheduled monument and direct impacts on 19 Grade II listed buildings and 81 lengths of historic hedgerow. One Grade I listed building is being restored.
Biodiversity	Moderate adverse	Potentially significant negative impacts on regionally protected sites including habitat loss and disturbance of sensitive species.
Water Environment	Moderate adverse	112 river crossing and impacts on 12 canals and 11 lakes although the environmental statement identifies that the impacts would be mitigated to the extent that no route-wide significant effects would remain.

Security	Moderate beneficial	New stations are expected to have better security, along with new rolling stock.
Accessibility	Slight beneficial	The released capacity specification offers slight improvements to access to services.
Personal Affordability	Not assessed	Fares not assumed to change.
Severance	Slight adverse	Impacts on 13 cycle routes and 27 footpaths, as well as leading to isolation of some.
Option Values	Slight beneficial	The addition of new high-speed rail services has an option value in that people would attach a value to being able to travel between urban centres with reduced journey times even if they do not plan to use it. However, existing connections exist so the benefit is slight.
Physical Activity	Neutral	There could be some very minor benefits from modal shift from road to rail, however these are thought to be insignificant.
Journey Quality	Slight beneficial	HS2 represents an opportunity to improve rolling stock quality, creating a better journey environment.

2.98 The APs and the SES outline small changes to the scheme at local level, which are not considered significant enough to alter the original assessment, which considered all the environmental and social impacts across the whole route.

2.99 The non-monetised assessment is not believed to alter the VfM category of HS2.

Landscape impacts

2.100 As per VfM Landscape Guidance, a quantitative approach to appraise the landscape impacts of transport investments has been undertaken, which uses monetised values for categories of landscape type affected by the scheme. Results suggest a dis-benefit of £2.7bn (PV, 2015 prices, in perpetuity) and £0.7bn (PV, 2015 prices, over 60 years). If the landscape impacts in perpetuity were to be incorporated into the Parliamentary Powers scenario, the BCR with WEI and without WEIs would fall by 0.1 to 1.1 and 0.9 respectively. Landscape impacts are not included in the core BCR and is only used as a sensitivity due to inherent limitations with the methodology.

2.101 The assessment of landscape impacts follows [the Department's value-for-money supplementary guidance on landscape](#). The Phase One values in this business case assumes landscape impacts increase with real GDP growth hence is not comparable to past HS2 business cases which use real GDP per capita growth. Route updates since the last Phase One business case had a marginal impact.

Distributional Impact Analysis

- 2.102 Using a propensity to travel method, non-business user benefits are assessed to benefit the highest income demographic but those benefits are well distributed across the demographics. Environmental impacts are particularly poor around the major termini, with young people in areas of lowest income demographic around Euston the most severely affected. The highest percentage of receptors showing increase in noise are located within the least deprived demographic areas.
- 2.103 Neither accidents or affordability were screened. This is due to a lack of data for accidents. Regarding affordability, an assumption has been made that ticket prices, fuel costs and station car park charges will be in line with existing WCML prices, resulting in neither positive or negative impact, and so were not screened.

3. Financial Case

- 3.1 Maintaining an affordable programme has been the subject of ongoing dialogue and scrutiny between HS2 Ltd, the Department and HM Treasury throughout the development of the Phase One programme. The Funding Envelope has been revised at several key decision points since the scheme's inception in 2009 in response to changing sponsor requirements, finalising the preferred route, developing a more robust cost estimate and reflecting the effects of inflation.
- 3.2 The Spending Review 2015 (SR15) funding settlement provided Phase One with a Funding Envelope of £27.18bn (2015 prices) which was adopted into the Development Agreement between HS2 Ltd and the Department. In 2019, HS2 Ltd informed the Department that the likely cost of Phase One would exceed the 2015 Funding Envelope. This receipt of this information formed part of the decision by Government to undertake the Oakervee Review.
- 3.3 Now that the Government has chosen to proceed with HS2, the Department has agreed a revised set of funding arrangements with HM Treasury for Phase One. These arrangements have been agreed in parallel with preparations to issue NtP for the main civils works construction. HM Treasury will remain closely engaged with the Department and HS2 Ltd on the anticipated final cost of Phase One and funding arrangements as part of improved governance of cost and schedule during delivery.

National Audit Office report on progress update

- 3.4 Published on 24 January 2020, the report (High Speed Two: A progress update) provides an update on the progress made across the project since the National Audit Office (NAO) last reported in 2016. They provide commentary on the delays to the schedule and the increases in forecast costs. With regards to the rising costs, the NAO identified the following factors:
 - a. The Funding Envelope for High Speed Two was set at any early point in the programme's development, before there was detailed information about how it would be built.
 - b. The methodology for calculating contingency required for Phase One was more appropriate for a programme at a later stage of development. The analysis did not take enough account of the uncertainty inherent in the programme at this stage.
 - c. HS2 Ltd is only now able to identify in greater detail the specific requirements of the railway's design. Previously, the company also had to make a number of assumptions on things like ground conditions, which have since proved to be less accurate, leading to further changes in cost.

- d. The Phase One Hybrid Bill introduced additional requirements for the railway following petitions from members of the public which further increased costs.
 - e. HS2 Ltd also made assumptions about other elements of the programme which have subsequently increased in cost. For example, HS2 Ltd will need to treat or replace some excavated material intended to construct the railway because it is of poorer quality than expected.
 - f. In addition, some savings which the company expected to benefit from did not materialise.
- 3.5 The Department and HS2 Ltd is determined to act in response to these findings and indeed has already done so. Key areas where improvements have been made include improved cost estimation, tighter financial controls, a revised Development Agreement, and revisions to contract terms. A sustainable Funding Envelope and Target Cost has now been agreed with HM Treasury. The Management Case provides further detail on how the Department will maintain a tight control of the programme during delivery.

Revised Funding Regime

Funding Envelope

- 3.6 A new Funding Envelope for Phase One of £45bn (2019 prices) has been agreed by the Department based on a net point estimate of £35bn and a contingency allocation above that. Table 3.1 details the breakdown of contingency for managing risks to the programme. It has been assumed that this funding will be ring-fenced for Phase One and funding for Phases 2a and 2b will be handled separately.
- 3.7 While setting an overall Funding Envelope for delivery of Phase One, the Department is also setting HS2 Ltd a target cost of £40bn, at the point of NtP. The purpose of this is to encourage cost control and tight management of contingency, and is informed by Reference Class Forecasts (RCF) and lessons learnt from other projects. Any contingency draw-down above this will need to be managed as set out in the Management Case.

Table 3.1: revised Phase One Funding Envelope and contingency delegations

Funding (2019 prices)	Phase One funding
Point Estimate	£35bn
HS2 Ltd delegated Funding Envelope (the “Target Cost”)	£40bn
HMG held contingency	£5bn
Total Funding Envelope	£45bn

Cost estimate

- 3.8 The baseline cost estimate of Phase One has been updated regularly during development of the programme. Updating the baseline process is an important part of HS2 Ltd's role and its evolution reflects the increasing design maturity, supply chain information, stakeholder requirements and Ministerial priorities.
- 3.9 In preparation for this FBC and move to full construction, HS2 Ltd undertook a comprehensive new Phase One baseline.

Setting the point estimate

- 3.10 Produced in 2019, Baseline 7 was the first estimate to be substantially informed by market pricing. Whereas the previous baseline relied 97 per cent on client derived costs, Baseline 7 has just under 50 per cent market prices, with 28 per cent from professional service providers with only the remainder relying on HS2 Ltd costs. This difference in design maturity is a reflection on where each cost pillar falls in the programme, with civils and stations work starting ahead of railways systems, rolling stock and the operational testing work that forms part of the final delivery stages.
- 3.11 The level of design maturity and extent of supplier pricing in the Baseline 7 cost estimate is such that the Department and HS2 Ltd has more confidence in the accuracy of the numbers. Design maturity in the main works civils contracts allowed by the two-stage contract structure (described in the Commercial Case) has resulted in cost pressures being revealed and risks more fully understood.
- 3.12 Following the deferral of NtP from December 2019 until April 2020, HS2 Ltd completed a short update to Baseline 7, Baseline 7.1, to reflect progress and performance of the project since the data-freeze in August 2019. HS2 Ltd's advice to the Department is that Baseline 7.1 continues to remain within the Department's £34.7bn point estimate. The Department considers that the application of the management overlay was a prudent course of action and retains its view of this as the point estimate for Phase One.

Challenging costs and maximising opportunities

- 3.13 The Department is confident that the revised funding arrangements, informed by the current baseline cost estimate and contingency allocations, provide a realistic range within which the programme should be expected to be delivered.
- 3.14 When programme cost pressures emerged in 2018 against the Baseline 6.1 estimate a programme of cost saving opportunities was initiated, forming an integral part of the Baseline 7 exercise. Together, the Department and HS2 Ltd carried out a comprehensive remediation exercise which included three key efficiencies workstreams:
 - Value engineering
 - Client-led opportunities
 - Sponsor-led change.

Value engineering

- 3.15 HS2 Ltd has undertaken extensive value engineering of the MWCC's technical designs in order to challenge the current specification and ensure that risk behaviours or design standards are not responsible for unnecessary cost increases. Through a series of internally conducted pilot studies and external assurance, opportunities to reduce cost in various asset classes have been identified.
- 3.16 External assurances, carried out by both independent experts and the Department's Project-Representative (P-Rep), tested whether efficiencies had been fully challenged or whether there were additional opportunities to save on cost. The result of these exercises is estimated to have identified opportunities to save £1bn from the cost estimate of the MWCC works packages. The expert panel and P-Rep report concluded that most design efficiencies have now been identified and further significant savings would be unlikely in this area. Whilst value engineering will therefore continue throughout MWCC Stage 2, the opportunity for savings is more likely to be in the less mature areas of stations and railway systems.

HS2-led Client opportunities

- 3.17 HS2 Ltd has examined opportunities to reduce technical requirements of the existing Phase One programme. These opportunities included both challenging design standards and simplifying operational requirements.
- 3.18 Opportunities were identified through significant collaboration with the MWCCs Joint Ventures (JVs) and Station Construction Partners. As standards and operating requirements are fundamental drivers of design, early decisions were necessary in order to be properly reflected in the latest baseline. Consequently, in the later stages of the Phase One design there will be less opportunity to pursue such savings without risking significant delays to the programme. As with supplier-led value engineering, the focus for client-led opportunities will increasingly be on stations and railway systems.

Department-led Sponsor change

- 3.19 The Department, in collaboration with HS2 Ltd has undertaken an exercise to identify and select viable scope reduction options for the Phase One scheme. Limited credible options that could improve the cost and schedule of the programme, without reducing the benefits of the scheme have been identified.
- 3.20 The Oakervee Review advised that the Department should continue to consider reducing the specifications of Phase One where it may be prudent do so, but only within the limits of the Phase One Act powers. The significant costs of making changes to these powers both in time and monetary costs would necessitate a very strong business case to consider materially changing the current scope.

Contingency and risk

3.21 All major projects and programmes require an allocation of cost and schedule contingency to account for potential changes to the programme during delivery. Applying contingency to a project therefore:

- Adjusts for residual optimism bias by HS2 Ltd and the supply chain;
- Makes provision for emergent risks, including those that cannot be foreseen at the point of baseline approval; and
- Allows the investment decision to be taken on what is intended to be an upper bound on anticipated cost, so that the project can be judged against other investments on a realistic basis.

3.22 It should be noted that there are a defined set of risks that are not accounted for in the baseline programme and contingency allocations because they are outside of HS2 Ltd control. These risks, retained by the Secretary of State, are stated in the Development Agreement and include risks related to excessive inflation, changes in Government policy and major geopolitical events. If any of these risks were to materialise then all steps to mitigate their impact would be considered before any further funding contingency would be drawn down.

3.23 As set out previously, the current baseline cost point estimate for Phase One is £35bn and the early schedule date for entry into service of an initial 3tph service between Old Oak Common and Curzon Street is 2029.

3.24 The Department and HS2 Ltd have evaluated cost and schedule contingency from three angles and then applied management judgement. The methodologies used to assess contingency are:

- Optimism bias adjustment as recommended in the HMT Green Book – this makes a simple cost or schedule uplift based on the type of project and its maturity but is rarely applied to schedule.
- Quantitative Cost Risk Assessment (QCRA) and Quantitative Schedule Risk Assessment (QSRA) – these use expert judgement to assess the probability distribution of each foreseeable risk and its likely cost and time impact and then uses Monte Carlo simulation to assess their effect in combination.
- Reference Class Forecasting (RCF) – this assesses the historic outturn performance of a range of projects with similar characteristics to the project in question and considers what cost and schedule contingency would need to be applied to achieve a predicted outturn if the current project performed on average as well or badly as the range of projects in the reference class.

Setting the Funding Envelope and Target Cost

3.25 In setting the Funding Envelope and Target Cost, the Department relied primarily on RCF as the most objective means of reviewing adequacy of contingency. RCF has the benefit of using an external rather than internal data set and provides evidence of actual outturn performance compared with

predictions for a large range of comparable projects at an equivalent level of maturity. RCF for Phase One has been carried out by Oxford Global Projects on behalf of Said Business School and uses a customised data set of 526 projects. The Department complemented the RCF analysis with the HS2 Ltd's QCRA to arrive at an overall judgement on the Funding Envelope and Target Cost.

- 3.26 Phase One will be set a total Funding Envelope of £45bn. The Funding Envelope is set at the point estimate (£35bn) with an allocation for contingency based on a P75 delivery confidence. RCF P75 (approximately 37 per cent on costs to go) would provide for sufficient funding for potential cost overruns seen in 75 per cent of the reference class. This equates to £10bn of contingency for Phase One. The Department considers it is uneconomic to allocate additional funding beyond this level.
- 3.27 Phase One will be set a Target Cost of £40bn. HS2 Ltd will be expected to deliver the programme within the Target Cost. It is set at the point estimate (£35bn) with an allocation for contingency based on a P50 delivery confidence. The RCF P50 (approximately 18 per cent on the costs to go) equates to £5bn of contingency for Phase One.

Handling inflation

- 3.28 The approach to inflation on HS2 has evolved during development of the programme to better reflect the specific inflation pressures that the programme could potentially face as the scheme's design maturity increases.
- 3.29 In advance of the FBC, HS2 Ltd commissioned NERA Economic Consulting (NERA) to develop a bespoke inflation model. Following assurance of this work, both the Financial Case and the Economic Case use NERA's forecast between 2020/21 and 2022/23 before converging linearly to NERA's estimate of an average historic figure.
- 3.30 Decisions on the use of appropriate inflation methodologies and construction cost inflation profiles will continue to be made by the Department and HM Treasury.

Operational finances

- 3.31 The Funding Envelope and the costs that it covers do not take account of any impacts resulting from the operational stage of HS2 and relate only to design, construction and rolling stock.
- 3.32 Once the construction phase is complete and Phase One services are introduced, the operation of services on HS2 will generate very significant revenues which are assumed to provide an income to HS2 Ltd and/or the Department. This will not improve the affordability of the programme during the construction phase, but will more than offset the costs of operating the railway and provide a commercial return to the Government for use on other projects.

Commercial receipts

3.33 Once operational, the railway will generate a number of commercial receipts through station retail, car parking, advertising and naming rights. These revenues, based on the assumed operational model, will return to the Government via surplus from the franchise. Therefore, these revenues will not directly support the affordability of Phase One but will generate income for the Government over the operational lifetime.

3.34 Receipts from Euston Over-Site Development are handled in a separate Business Case.

Operational expenditure and income

3.35 Once HS2 is fully operational there will be an improvement in the financial position of Britain's railways. Our analysis suggests that this could range from around £170m (Phase One) to £670m (Full Network) per year. This is consistent with findings in previous business cases. There will be a benefit to the taxpayer, if the operating surplus from HS2 is available to the Government to meet the additional subsidy requirement for conventional services. This surplus could be in the form of an improvement in the annual subsidy/premium balance for Britain's railways, or the receipt of an up-front capital sum. A decision has not yet been taken on how these monies will be recovered by the Government as this will depend on future decisions on the operating and commercial model for HS2. To recover some or all of this surplus via the Infrastructure Manager, the Government intends for HS2 Ltd to levy an Investment Recovery Charge on all operators using HS2 infrastructure.

3.36 The level and profile of the subsidy/premia balance have changed considerably since this was last considered in the 2017 Phase 2a OBC. In terms of the profile, this can be attributed to the change in opening dates, reducing the pressures on affordability in early years; a more accurate representation of testing and commissioning costs, leading to a more gradual growth in deficit around phase openings; a more realistic set of maintenance cost estimates; and an improved methodology for estimating rolling stock capital lease costs, which causes a relative deterioration in the financial position in the 2060s.

3.37 The difference in level is driven by an increase in estimated incremental industry revenues, reflecting underlying industry demand growth and modelling improvements; a decrease in HS2 operational costs driven by the introduction of a bottom-up cost estimation methodology; a revision of rolling stock maintenance estimates due to a change from RPI to CPI inflation, reflecting actual contractual arrangements; and the inclusion of refurbishment costs and improvements in methodology for rolling stock capital lease charges.

3.38 Sensitivities undertaken on this analysis are a subset of those used for the Economic Case, along with one or two additional sensitivities and reflect those most relevant to considerations on ongoing affordability. Across each sensitivity the ongoing financial position remains positive. Switching values have also been

calculated for operating costs, which suggest in order to reverse the improvement to the industry subsidy/premia balance, operating costs would have to increase by around one third.

Investment Recovery Charge

3.39 Analysis suggests that HS2 services are likely to generate an operating surplus in each reference case and an improvement on the 2017 business case. However, the scale of the surplus is still uncertain. The Government intends to maintain flexibility on how best to realise this value for the taxpayer, as recompense for the funds invested in HS2's construction. The completion of HS1 (the Channel Tunnel Rail Link) in 2007 was followed three years later by letting a 30-year infrastructure concession. While the Government has not decided at this stage whether to pursue a similar model for HS2, retaining the ability to sell HS2 as an infrastructure concession is an essential requirement for the programme, and HS2 Ltd is instructed in its Development Agreement to ensure that this option remains available.

3.40 The Government intends that HS2 Ltd as Infrastructure Manager will levy an Investment Recovery Charge on all users of HS2 infrastructure. The Investment Recovery Charge is essential to preserve the option of a future concession sale of HS2, as it provides an income to the Infrastructure Manager that is over and above the direct costs it incurs. Without such an income stream the concession sale value of HS2 will be insufficient for this to be a credible option. With an Investment Recovery Charge in place on HS2, the Government will have a choice between the early sale of a concession to raise significant funds upfront, or to retain ownership of HS2 and take the surplus revenues as an ongoing income stream. Without an Investment Recovery Charge this choice will not be available.

3.41 However, the Office of Road and Rail (ORR) will not make its final determination on this matter until much nearer the start of HS2 operations. The Department has therefore engaged with ORR prior to the decision to proceed, to understand the basis of its determination of this matter. The Department has satisfied itself that, so long as sufficient documentary evidence is provided to ORR, it is reasonable to conclude at this stage that an Investment Recovery Charge will be permitted.

Accounting implications

Construction phase

3.42 The up-front capital costs of the construction of the Phase One programme are funded by HM Treasury, with the Department sponsoring HS2 Ltd to take forward the construction of the HS2 programme. As such:

- accounting for the expenditure of HS2 Ltd will follow international accounting standards and the FReM (Financial Reporting Manual);

- land and property is on the Department's balance sheet reflecting that HS2 Ltd has acquired land in the name of the Secretary of State. Any income and operating expenses associated with the land and property portfolio will be recorded in the Department's financial statements.
- HS2 Ltd's accounts will continue to be consolidated into the Department's group accounts and accounting policies and bases will need to demonstrate consistency across the Group.

Operational phase

3.43 At this point in time it is not possible to assess the accounting treatment during the operational phase as it is not clear under what structure HS2 services would operate, their relationship with the rest of the rail network or even what the current rail network would look like at that time.

3.44 Future changes to the accounting framework could make any analysis obsolete. The starting premise is, however, that HS2 Ltd will be required to prepare financial statements in accordance with either IFRS or FRS 102 (New UK GAAP) under the Companies Act and the Department will be required to prepare consolidated financial statements under an analogous regime. The arrangement between the Department and HS2 Ltd is likely to be either a service concession or a lease. IFRS and New UK GAAP are currently aligned on the treatment of service concessions, but not on the treatment of leases (though they should be aligned by the completion of the infrastructure). While the accounting guidance for service concession assets designates the two parties as a "public sector grantor" and a "private sector operator", this may not preclude the use of this accounting treatment if other characteristics of the arrangement between the Department and HS2 Ltd indicate that it is the best fit. It has been assumed that, during the construction phase, the Secretary of State holds legal title to the land and HS2 Ltd purchases and holds legal title to the infrastructure, unless a subsequent transaction takes place.

3.45 It is likely that any accounting treatment will depend on two factors: the sector classification of HS2 Ltd (or the future body/company responsible for managing and exploiting the HS2 infrastructure asset), and the characteristics of its relationship with the Secretary of State. It is worth noting the following:

- if HS2 Ltd (or successor) is classified to the central government sector, it will be consolidated by the Department and all of its assets and liabilities will be treated as the Department's assets and liabilities on consolidation. However, HS2 Ltd will still need to account for the arrangement in its Companies Act financial statements; or
- if HS2 Ltd is not classified to the central government sector, but the relationship involves government regulation, and is time-limited, with control over the reversionary interest lying with the Department (as in the case of HS1), then the Department will treat the infrastructure as its asset, with a matching liability in its consolidated financial statements; or

- if HS2 Ltd were privatised and/or granted an indefinite right to operate the infrastructure, and if the business is commercially viable, to the extent required for it to be classified outside the central government sector, then it is likely that the Department would not need to treat the infrastructure as its asset in its consolidated financial statements.

Application of VAT

3.46 In 2014, HS2 Ltd applied for and was granted ‘intending trader’ status by HM Revenue and Customs. HMRC revised that decision in 2019, resulting in VAT liability for the construction costs of HS2.

3.47 Following this, HM Treasury is putting in place procedures to allow HS2 Ltd to reclaim VAT via a Statutory Instrument and Treasury Order. As a result, HS2 Ltd’s costs exclude most VAT from the start of the 2020/21 financial year, except for payments to vendors of opt-to-tax properties.

4. Commercial Case

4.1 This section outlines the key services that HS2 Ltd will require to deliver the programme and provides a high-level view of the requirements for Phase One and further context for the procurement strategy.

Output Specification (Sponsor's Requirements)

4.2 The commercial case format requires an Output Specification for the given programme, in the case of the HS2 programme this is the 'Sponsor's Requirements'. The Sponsor's Requirements are set out in the HS2 Project Development Agreement between the Secretary of State HS2 Ltd, [as published online](#).

Delivery Stages

4.3 The three stages of the Phase One programme are:

- Pre-Development/Development
- Delivery
- Ownership and Maintenance

4.4 The activities in the Pre-Development/Development and Delivery stages are articulated below with the Ownership and Maintenance stage being subsequent to the successful outcome from Delivery. This commercial case focuses on the work undertaken to ensure success in the Delivery stage.

Pre-development/development

4.5 The Development stage of Phase One is complete, with Royal Assent achieved on 27 February 2017. Key services procured for this phase included:

- Outline route design
- Environmental impact specialists
- Consultation support and response analysis
- Legal, financial, and commercial advice
- Engineering Development Partner contract for Phase One, awarded to CH2M Hill (now Jacobs following the acquisition of CH2M Hill by Jacobs).
- Land and Property Services Framework Agreements
- Detailed engineering work
- Environment consultants
- Parliamentary agents

Delivery status

- 4.6 The Phase One Delivery stage builds on the investigative and design work from Pre-Development and comprises a series of large and complex contracts. HS2 Ltd has been tasked with deriving the optimum strategy to deliver the programme to time and budget from strategy inception through procurement and to management of the outcomes from each contract in-line with the programme requirements.
- 4.7 Some of the contracts are now in the management phase following the successful procurement and selection of a Supplier to undertake the works. Other contracts are at the strategy phase or pre-contract with procurement underway. The value⁵ and status of each of these major Phase One contracts is detailed below.

Enabling Works

- 4.8 Enabling works contracts (x3) prior to construction activities to prepare the site have been awarded. These include:
 - Utility diversion works;
 - Archaeological works;
 - Demolition works;
 - Site clearance works;
 - Ecological works

Civil Engineering

- 4.9 Main Works Civils Contracts (seven contracts across four JVs) for Civil Engineering services along the Phase One route have been awarded. This includes work for tunnels and surface route. Contracts have been divided geographically.
- 4.10 This strategy allowed bidders to tender a maximum of four contracts and win a maximum of two, with a framework formed from the successful bidders which allows for an option to use this framework to deliver Phase 2a. The works include:

Tunnels

- Cut and cover tunnels;
- Bored tunnels;
- Portals;
- Shafts;
- Sprayed concrete
- Tunnel boring machines;
- Ring segments.

Surface Route:

- Site clearance;
- Earthworks;
- Drainage;
- Structures;
- Viaducts;
- Highways;
- Line wide logistics

Stations

4.11 Four stations are to be delivered in the Phase One programme. This includes the detailed design, enabling works, site preparation, substructure, superstructure, fit out, mechanical and electrical installation, external works, over-site development enabling work and station systems.

4.12 Station Design Services Contracts (x4) have been awarded. These contracts include development of the concept design, in consultation with a wide range of stakeholders, progressing station designs to Planning Application and supporting HS2 Ltd in scoping and gaining other relevant consents. The contracts also include developing and managing the integration with other interfaces and common design components within a BIM environment

4.13 Construction Partners for Euston and Old Oak Common have been awarded, and will provide industry expert advice on constructability, logistics and phasing plus the associated costs and risks, early in the design development. Following pre-construction phase the Construction Partner will be responsible for procuring, managing and delivering Services/Works packages to complete the design, construction, testing, commissioning and handover of the Southern Station(s). Euston: £1.65 billion; Old Oak Common: £1.3 billion.

4.14 Curzon and Interchange Design and Build contracts to progress the design, construction, testing, commissioning and handover of the station are to be awarded. The contract will be based and priced on the HS2 Ltd design upon which planning approval is granted.

Railway Systems

4.15 Six packages for Rail Systems are yet to be awarded. The railways systems category covers the following functional areas for both Phase One:

- Track and overhead line equipment
- Tunnel and Open Route Mechanical and Electrical Fit out and ventilation
- HV Power Distribution (including Traction Power Infrastructure – Lineside Auto Transformer Stations (ATS) and Auto Transformer Feeder Stations (ATFS))
- Signalling and Traffic Management

- Telecommunications (including Data Transmission network and Emergency Services Radio Network)
- Network Integrated Control Centre (NICC)
- Building and Washwood Heath Depot (WWH)
- Systems Integration.

4.16 As articulated in the 2017 Category plan and subsequently updated in early 2019 following a strategic review of Rail Systems, procurements are being developed to let contracts for the following:

- Package 1 – Track: Four contracts for track civils geographically let including: Overhead Catenary System – supply and installation of the steel and gantry work (design element already awarded); Slab track manufacture and supply contract (procurement under way); Switches and Crossings supply contract; Long welded rail supply contract.
- Package 2: Mechanical and Electrical: Open route and tunnel contract for all M&E works design and fitout; Cross Passage Doors - design, supply and installation (procurement underway).
- Package 3: High Voltage Power: Contract for Design and Build and option to maintain of HV power systems.
- Package 4: Communications: Contract for the operational communications systems for the railway; Contract for the passenger communications network; Contract for security systems and CCTV systems linked to operational communications.
- Package 5: Command Control Signalling (CCS): Contract for the route wide signalling solution for train operation; Contract for Engineering Management System.
- Package 6: Washwood Heath (WWH) Depot and NICC: Contract for the design and build of the WWH depot and control centre.

Rolling Stock

4.17 Design, manufacture, testing, commissioning and maintenance of a fleet of 54 ‘conventional’ compatible trains, including options for up to 30 more trains. The initial fleet provision includes enough trains to service the currently proposed Phase One and 2a train service specification.

4.18 The contracts are yet to be awarded and include: Design, manufacture, testing, commissioning and maintenance of a fleet of 54 ‘conventional’ compatible trains, including options for up to 30 more trains. Includes on-board signalling but excludes depot and wayside signalling. Initial 12-year maintenance term (Train Services Agreement) with options to extend to whole life of the fleet (35 years).

Shadow and Future Train Operator

- 4.19 First Trenitalia (a consortium of First Group and Trenitalia) were announced as the successful bidder for the West Coast Partnership and HS2 Shadow Operator by the Department in August 2019.
- 4.20 Avanti West Coast, the Train Operating Company owned by the consortium, took over the operation of existing WCML franchise services from 8 December 2019. Their remit is to combine the operation of the existing services with Shadow Operator advice to the Department on development of commercial and passenger elements of the HS2 service, and implementing all aspects of HS2 train operations, including the testing and commissioning, trial operations and full commercial service phases of the project.

Procurement strategy

Procurement approach and market capability and capacity to deliver

- 4.21 HS2 is one of the largest infrastructure projects in the UK and tasked with delivering some of the highest value complex construction contracts in Europe. With recognition of the size of this task and the importance of the contracts to the project but also the UK and European supply chain, HS2 Ltd developed structured procurement strategies before approaching the market. Strategies for each of the categories described in section 2 were completed setting out the holistic plan for the procurement of the works and services required for Phase One.
- 4.22 The approach to the market is articulated by a procurement strategy for a group of related contracts, under a holistic strategy named the Category Plan. Category plans have been developed for each of the four procurement pillars;
- a. Main Works Civils;
 - b. Stations;
 - c. Rail Systems; and
 - d. Rolling stock.
- 4.23 The approved Category Plans are detailed in their nature, assessing the route to market, the commercial approach, the suppliers in that market and providing a high-level summary of the procurement approach.
- 4.24 The Category Plans follow a structure derived from Infrastructure and Projects Authority (IPA) guidance which provided recommendations to improving infrastructure delivery. The guidance states “procurement optimises both the delivery of requirements and the clear articulation and allocation of risk for the client and the supply chain.”
- 4.25 Each HS2 Category Plan (and consequent procurement plans for each contract) articulates clearly the requirements of the project, the outcomes and benefits expected, and answer the following key questions:

- The market appetite, capability and capacity to provide the services required and engage in a longer-term strategic relationship
- Which risks are best managed in-house, based on the organisation's risk appetite, and which risks are best placed with and managed by the supply chain
- The key business drivers for the suppliers, both reputational and remunerative, within the various markets that will deliver the requirements
- How the procurement will support the proposed target operating model and client model being adopted

4.26 The Category Plan is assured through both HS2 Line of Defence (LoD) assurance and governance as well as presented to the Department at its investment committee (IPDC).

4.27 The development of the early procurement strategies (Enabling Works and Phase One Main Works as described in a subsequent section) were reflective of status of HS2 development in 2015. Subsequent procurements realised a development in that thinking, which has been further built upon with the strategies which have been outlined in the Category Plans for Stations, Rail Systems and Rolling Stock.

4.28 HS2 Ltd has always recognised that the Category Plan (and the consequent Procurement Plans for each contract) should be fully tested by engaging with the market. As set out in the Category Plans and agreed by the Independent Assurance Panel, "good procurement" has six primary sets of activities:

- a. Understand and communicate requirements
- b. Engage the market
- c. Package the works
- d. Choose the risk allocation model – Contracting Model
- e. Choose the route to market
- f. Communicate the benefits

4.29 HS2 Ltd has taken these primary sets of activities to check packaging, commercial model, route to market and delivery of benefits and communicated them to the market to test the strategy. This has allowed the procurement strategies to respond to a changing market place to ensure competition and achievement of the benefits HS2 requires whilst optimising value.

Responding to the market

4.30 In 2018, Category Plans for Rail Systems and elements of the Stations Plan were further considered to reflect performance of the current HS2 arrangements and the macroeconomic factors. Early indications from some Rail Systems and North Stations procurements that had been commenced had shown a limited appetite for HS2 contracts.

4.31 The review of the Category plan approach for Rail Systems sought to:

- Incorporate lessons learnt from contracting approach for as-let contracts and consider the overall existing supplier relationships particularly with the changing macroeconomic conditions and the risks arising from the scale of HS2 Ltd's contracts
- Assess the impact from the market intelligence from Package 1 and 2 of the Rail Systems procurements and how risks can be mitigated
- Consider the constructability and deliverability of the programme and incorporate emerging thinking from the Baseline 7 review

4.32 A process of review took place for all major live and future contracts from October 2018 to February 2019 conducted by a mix of internal HS2 staff, third party support teams and the Department. The findings of the review were approved by HS2 Ltd Board and the Department in May 2019 and where relevant, reflected in an updated Category Plan.

4.33 The revised approach optimises the competition at tender and drives best value in the commercial approach. This approach will vary in different contracts to reduce the risk to HS2 of cost overrun in the management of the contracts once let, as summarised below:

- For Curzon Street station a revised procurement approach was developed which allows for a two stage Early Contractor Involvement contracting approach with a single contractor selected to collaboratively develop a target price and delivery schedule before commitment to proceed to detailed design and construction.
- For Rail Systems, a greater level of design maturity prior to approaching the market will aid competition and certainty of target price for each contract. This will also reduce the tendering burden on suppliers which will be required to do less design through the tendering cycle.

4.34 The Rolling Stock procurement is following the agreed Category Plan and currently at the evaluation stage of the procurement after which a contract award will be made. The rolling stock market is sensitive to market and economic influences, but they are different to the wider rail and construction industry. It was also found that there was sufficient competition in the early market engagement and through the procurement cycle.

Catalyst for economic growth

4.35 A strategic goal of HS2 is to be a catalyst for sustained and balanced economic growth across the UK. This is reflected in ITTs and Contract(s) awarded which maximise the opportunity for SMEs to support the provision of services and works. There is also a HS2 Fair Payment Charter for all the Supply Chain.

4.36 There are other HS2 strategic initiatives that are tested at procurement and translated into requirements in the contract including skills and employment, Equality, Diversity and Inclusion (EDI) and Health and Safety (H&S). The contracts include deliverables supporting investment in the HS2 Project that leave a lasting skills and employment legacy beyond the construction of the new

railway. They require the delivery of a range of Skills, Employment and Education ('SEE') outputs and create a culture which aims to attract and retain the best and most diverse range of people possible.

- 4.37 The cultural-fit of the supplier with HS2 strategic principles is demonstrated in the contract for safety, health and wellbeing and flows through to the environmental sustainability and community engagement tasks suppliers are required to perform on HS2 Ltd's behalf as part of delivering a design and end-state solution that can be built economically and efficiently, meeting sustainability and "good neighbour" requirements for local communities.

Determining the optimal strategy for competition

- 4.38 To determine the correct level of competition before tendering and to check the capacity of the market, HS2 Ltd performs comprehensive checks during the tendering cycle. Many of HS2 Ltd's contracts are of a size, complexity and value that will appeal to larger Tier 1 Suppliers, but HS2 is cognisant of the value that Small/Medium Enterprise (SME) organisations can bring to the delivery of services. As such, the government's "Compete For" portal is used by HS2 Ltd and while it also advocates its use by the Tier 1 for its subcontracts.
- 4.39 As a non-departmental public body, HS2 Ltd is required to comply with the requirements of the latest Utilities Contracts Regulations (UCR). As a utility, HS2 Ltd procures under the UCR 2016 regulations. HS2 Ltd obtains ongoing assurance and advice through the Lines of Defence (LoD) process, employs internal legal team members who are procurement specialists and contracts with third party legal firms specialising in Procurement Law.
- 4.40 As part of the procurement process Industry days are held for all major procurements and feedback is gathered to gauge the overall appetite to bid, and test what areas of the revised strategy would improve or reduce overall appetite to submit a bid.
- 4.41 The engagement with the market does not finish upon award of the contract. HS2 Ltd assists the supply chain in "meet the supplier" events facilitating new relationships between HS2 Tier 1 and new SME subcontractors. In 2018 "meet the supplier" events were conducted for Enabling Works Contracts (EWCs) and Main Works Civils Contracts (MWCCs) and to date HS2 Ltd have introduced 339 businesses through 1453 one-to-one sessions. Of the 339 businesses, 99 per cent have been based in the UK and 79 per cent of those have been classified as an SME. Additionally, HS2 Ltd runs an active engagement programme with its most significant suppliers and partners.

Contract awards

Overarching contractual principles

- 4.42 HS2 Ltd mainly uses the standard New Engineering Contracts 3 (NEC3) suite of contracts to place commercial agreements with the supply chain from the result of procurement exercises. A relevant commercial model is chosen using

one of the standard NEC options (A to E) which is selected during the procurement planning stage and articulated in the Category Plan and the Procurement Plan for the specific contract. Relevant commercial positions are also taken to mitigate the risk to HS2 Ltd e.g. securities such as a parent company guarantee, an owner controlled insurance programme (OCIP), and price adjustment mechanisms that reflect reality on foreign exchange and inflation. These are balanced with regimes as to how the supplier can be incentivised throughout the lifecycle of the contract (which are articulated prior to the issue of the invitation to tender).

4.43 In order to effectively operate the NEC3 contracts, HS2 Ltd has sought to structure its organisation and recruit the staff to fill commercial, financial and project roles to manage the contract. To complement the recruitment of staff, appropriate systems to manage the contracts are in place which provides certainty of output of the Supplier in terms of programme and budget. The people and systems are supplemented by a governance model which provides procedure to the operation to ensure the correct authorities are in place when managing the contracts.

Contracts awarded to date

4.44 Contracts awarded to date for Phase One cover three main programme areas: Enabling Works Contracts (EWCs), Main Works Civils Contracts (MWCCs) and Stations. A number of other contracts have also been awarded which cover ground investigations, essential design work (e.g. railway systems early design to support interfaces with MWCCs) and other early works. These are in addition to outline design, environmental and other contracts awarded during the Pre-Development / Development stages of the programme.

4.45 Across EWCs, MWCCs and Stations, a number of contracts have been awarded which collectively constitute a significant proportion of the Phase One scope and value. The programme areas and relevant contracts are set out in the table below.

Table 4.1 EWC, MWCC and Station Contracts Awards

Programme Area	Reference	Description
EWC	EWC South	Enabling Works Contract – Area South
EWC	EWC Central	Enabling Works Contract – Area Central
EWC	EWC North	Enabling Works Contract – Area North
MWCC	S1	Euston Tunnels and Approaches
MWCC	S2	Northolt Tunnels
MWCC	C1	Chiltern Tunnels and Colne Valley Viaduct
MWCC	C2	North Portal Chiltern Tunnels to Brackley
MWCC	C3	Brackley to Long Itchington Wood Green Tunnel South Portal

MWCC	N1	Long Itchington Wood Green Tunnel to Delta Junction / Birmingham Spur
MWCC	N2	Delta Junction to West Coast Main Line Tie-In
Stations	S3 SDSC	Stations Design Services Contract – Euston
Stations	S4 SDSC	Stations Design Services Contract – Old Oak Common (OOC)
Stations	N3 SDSC	Stations Design Services Contract – Interchange
Stations	N4 SDSC	Stations Design Services Contract – Curzon Street
Stations	CP – Euston	Euston Station Construction Partner
Stations	CP - OOC	Old Oak Common Station Construction Partner

Enabling Works Contracts (EWCs)

- 4.46 Three EWCs were awarded on a geographical basis, covering South, Central and North sections of Phase One. These provide essential enabling works such as demolition, ecology, utilities, site clearance, archaeology and water course activities. The contracts were let in a way to expedite delivery of the programme and provide commercial structures to optimise value-for-money.
- 4.47 The EWCs are let under NEC3 terms, with the scope of specific work packages agreed and instructed as required. Delivery of each contract is incentivised based on key milestones / handover dates to the Station Contractor and/or MWCC.
- 4.48 EWC procurement was undertaken in the early stages of the Phase One programme, before the Phase One Act became law. Contracts were awarded in November 2016 in order to allow enabling works to support the challenging construction schedule.
- 4.49 Significant EWC work has been completed, with work scheduled to ramp down during 2020. As at October 2019, around 78 per cent of EWC work has been let as work packages.

Main Works Civils Contracts (MWCCs)

- 4.50 The MWCCs are the vehicle by which HS2 is delivering the civil engineering works required for Phase One of the programme.

Market Engagement, Contract Strategy and Award

- 4.51 Based on market engagement, MWCC packages and sizes were developed to match supplier capability, capacity and appetite. This resulted in seven geographical packages with bidders allowed to tender for a maximum of four contracts (Lots) and win a maximum of two.
- 4.52 HS2 Ltd adopted a Two Stage / Early Contractor Involvement model for Design and Build, where the detailed design/build element would be on a NEC Option C (Target Cost) basis. This recognised the low level of maturity of the design provided by HS2 Ltd (and the level of design that would have to be completed during the tendering phase should suppliers be asked to price a single stage target cost approach and the significant work and substantial cost to the

tenderers which that would entail). In turn, this would have been unattractive to the supply chain where bid costs would have been very high and although the chances of winning one of the 7 lots might have been perceived as high, the construction industry was sensitive to this cost versus risk of being unsuccessful.

4.53 The strategy resulted in a good level of competition for this procurement with the pre-qualification of nine tenderers each bidding for between one and four Lots. Each Lot had either four or five tenderers.

4.54 The outcome of the tendering process was the award in July 2017 of seven Two-Stage NEC Option C (Target Price with Activity Schedule) contracts, split geographically, to four Joint Ventures:

Table 4.2: MWCC Joint ventures

Reference	MWCC	Joint Venture
S1	SCS	Skanska Construction, Costain, STRABAG
S2		
C1	Align	Bouygues Travaux Publics, VolkerFitzpatrick, Sir Robert McAlpine
C2		Eiffage Genie Civil, Kier Infrastructure and Overseas (awarded to CEK which became EK following the liquidation of Carillion Construction Limited)
C3	EK	
N1	BBV	Balfour Beatty, VINCI Construction

Evolution of commercial position for MWCCs Stage Two

4.55 In Stage One, the contractors were responsible for finalising the scheme design and agreeing a target price and schedule for Stage Two. Stage Two will focus on the detailed design and delivery of the civil engineering works.

4.56 The key focus was for the MWCCs to deliver savings against HS2 Ltd's pre-defined budgets set at the time of tender. The benefit of this model was earlier visibility of a more credible scheme cost, allowing the MWC Contractor the opportunity to influence the design and generate cost savings. It also removes traditional "tender optimism" which is then typically followed by progressive cost increases and disputes during construction.

4.57 During Stage One a number of Gateways were established to provide progressive assurance and visibility of the emerging design, cost and schedule. During this time, a number of factors emerged, which have challenged the context of MWCC schedule and cost:

- A commitment to an end date and estimated cost was made very early in the development of the scheme
- Ground information available was limited
- HS2 Ltd standards and specifications were at a developing stage of maturity

4.58 At Gateway 4 in October 2018, the MWCCs indicated that the Initial Target Prices in the contracts were not achievable, and that elements of the existing model for Stage Two, such as risk allocation, were driving MWCCs to be conservative in design, schedule and estimate compilation which would not support achieving value-for-money.

4.59 The key areas of concern for the MWCCs, driving behaviours were potential exposure to 60 per cent pain-share, potential levels of delay damages, ground condition risk and fitness for purpose obligations. The large administration load that is a consequence of the NEC target price option (via management of compensation events) was also driving excessive indirect costs.

4.60 The additional drivers behind the cost and schedule pressure were:

- Macro-market factors:
 - A lack of financial stability in the UK Tier 1 contractors and emphasised by the demise of Carillion (initially part of the EK JV)
 - Lack of certainty over Brexit and other economic issues driving up the price of goods and services
 - A reduction in the market appetite to risk was resulting in a tightening of supply chain governance, shareholder controls and insurance markets
- Local (MWCC) factors:
 - As scheme design has progressed, the complexity and constraints to construction have increased
 - The ground conditions encountered did not match those anticipated from desk-based studies
 - The anticipated economies of scale were difficult to achieve, e.g. preliminaries and staff costs

4.61 In response to the unaffordable position at Gateway 4, HS2 Ltd took the decision to adjust the commercial and delivery models for the MWCC's, taking an approach based on the following overarching principles:

- Team and Board structures: establishment of Integrated Project Teams (IPTs) whereby HS2 Ltd, Contractor and Designer work together to achieve a common goal.
- Contract structure: seven contracts consolidated to be managed as four (one per JV). An updated Partnering Charter to encourage good behaviours and ways of working.
- Incentivisation: a greater protection of contractor's costs whilst they are incentivised to deliver through a fee moderation mechanism based on performance against pre-defined targets. Opportunity for the contractor to share in any savings against the budget.

- Risk management: a tiered approach to risk management with the contractors given autonomy to manage risks within their control. Cross-programme risks and traditional Employer's risks are held by HS2 Ltd, materialisation of which will constitute change under the contract.

4.62 Since instruction of the revised model in November 2018, HS2 Ltd has worked with the MWCC's to develop the details of the commercial model. The detail of the model is summarised below:

- Incentive Budget: each of the MWCC's will be set an Incentive Budget for their contracted work. The Incentive Budget consists of Point Estimate (Direct and Indirect Cost), Project Risk and Fee. The MWCC's are incentivised to outperform their Incentive Budget, with the opportunity to earn a share of any savings.
- Fee Moderation: the fee adjustment mechanism incentivises the MWCC's to outperform against incentive budget and schedule targets. Performance is assessed on an annual basis, fee moderated according to the contract provisions and applied to next and subsequent payments.
- Schedule Upside: the introduction of this mechanism gives the MWCC the opportunity to earn an enhanced fee based on their schedule performance against key handover milestones. To ensure that the focus remains balanced, the enhanced fee will be moderated based on their performance against HS2's wider objectives (Community Engagement, H&S and Environmental).
- Compensation events and risk allocation: the definition of change which constitutes a compensation event has been amended to reflect the revised risk management and ownership. Project Risk is contained within the Incentive Budget, this is for risks which are within the contractors control to manage, and therefore do not constitute a compensation event. Risks which are not allocated to Project Risk, may still constitute a compensation event.
- Business Case incentivisation: this mechanism provides the MWCC with an incentive to identify opportunities through innovation which could lead to cost savings across the wider Phase One programme. An identified opportunity must be presented in the form of a business case and approved by HS2 Ltd.
- Partnering Charter: will be introduced to each MWCC, it will be a contractual document which links to the core contract. The purpose of the Partnering Charter is to set out the ways of working and behavioural expectations in the IPTs. Collaboration is crucial to the success of the new commercial model, hence the requirement for this charter to drive the expectation.
- Collaboration Agreement: an existing agreement, amended to reflect the introduction of a Programme Risk pot which contains risks with the potential to have a cross-programme impact. The MWCC's are incentivised to manage and mitigate Programme Risk, with the opportunity to share in any savings.

4.63 Since the instruction of the revised commercial model, the introduction of IPTs and ways of working, HS2 Ltd has worked with the MWCC's to develop a

number of products for each contract: point estimate, quantified risk, schedule and assumptions and exclusions (among others). Each product has been revised taking cognisance of the commercial model and IPT structures to drive efficiency in all areas.

4.64 Additional milestones were set in between the already existing Gateways, designed to test the suitability of these products along with behaviours, efficiency of organisation structure and maturity of scheme design. The milestones and Gateways have enabled HS2 Ltd to progressively test and assure each of the MWCCs to establish their capacity, capability and affordability for Stage Two.

4.65 The approach for Stage Two provides a balanced approach to risk allocation, which drives out estimating conservatism, and seeks to ensure value-for-money for the UK taxpayer. In addition, it incentivises the MWCCs to outperform and deliver savings against their respective Target Prices and to proactively manage risks.

Commercial assurance

4.66 The Oakervee Review concluded that “ahead of issuing NtP for Phase One, the government should ensure that HS2 Ltd achieves a satisfactory position with each of the main works civils contractors in order to obtain acceptable stage 2 prices” and that if this was not possible “HS2 Ltd... may have to consider re-procuring some or all of these contracts”.

4.67 Prior to NtP, HS2 Ltd closed on an agreed position on price, contract form and incentives with all the JVs. The Department is content that the negotiated commercial positions agreed with the JVs are acceptable value-for-money, with an incentivisation package designed to deliver gain-share savings during construction and limit further cost exposure above the target price.

4.68 Prior to approval of the FBC, the Department and Cabinet Office carried out a commercial review to stress-test the MWCC negotiated positions. The review endorsed the view that the historic HS2 Ltd commercial strategy had not met its aims due primarily to the cost inflation and construction industry risk appetite post Carillion and the collapse of the gainshare regime.

4.69 HS2 Ltd’s revised commercial model provides a lower level of risk transfer in order to avoid disproportionate risk premiums. It was agreed that the revised commercial model was a pragmatic response within market constraints, given that the best alternative was a two-year re-procurement with no guarantee of a better outcome on cost, incentives or risk allocation.

4.70 In the revised model project risks continue to sit with the MWCCs, with programme risks held by HS2 Ltd. This risk allocation is supported by a programme fund for HS2 Ltd risk and a residual share mechanism to help drive the right behaviours from the MWCC JVs.

4.71 These findings have also been broadly reinforced by a separate, independent review carried out by Turner & Townsend. Lessons about the size of the

packages, risk allocation and the lack of contestability in the two-stage strategy will now be learned for Phase 2 and other construction projects.

Stations

- 4.72 Four Station Design Services Contracts (SDSCs) were awarded in February 2018. The SDSCs are developing the designs which form the basis of Construction Partner (CP) contracts for Euston and Old Oak Common stations (awarded during 2019) and Design and Build contracts for Birmingham Curzon Street and Birmingham Interchange (yet to be awarded, see 'Contracts to be Awarded' section below).
- 4.73 The procurement of the SDSCs and then CPs demonstrates the evolution of HS2 Ltd's thinking to optimise the commercial risk in the build phase by providing the delivery suppliers and contractors with greater certainty of design and therefore ensure a more value-for-money target price (which is subject to less adjustment over the life of the contract).
- 4.74 The SDSC and CP procurements had sufficient levels of competition at procurement phase to allow the award of the contracts with good levels of certainty to demonstrate best value. The two CP contracts were awarded in 2019.

Contracts to be awarded

- 4.75 The primary contracts yet to be awarded are for Design and Build of the two Birmingham stations; contracts within the six Railway Systems package (other than the Overhead Catenary System, for which the design element has been awarded); and Rolling Stock.
- 4.76 NtP for Stage Two of the MWCCs are steps within the awarded contracts and are addressed in the relevant section above.
- 4.77 Design and Build contracts for Birmingham Curzon Street and Birmingham Interchange are due to be awarded in 2020/2021.

Birmingham Curzon Street Station

- 4.78 The original procurement for the station design and build contract was launched in November 2018 (PQP release) as a single stage design and build target price contract, however this was cancelled in the light of limited market response. Feedback from the market indicated that the poor response was as a result of a number of issues but specifically the single stage design and build target price contract and an undesirable risk profile (with insufficient confidence that design would be sufficiently mature to enable accurate pricing).
- 4.79 A revised procurement approach was developed which allows for a two stage ECI contracting approach with a single contractor selected to collaboratively develop a Target Price and delivery schedule before commitment to proceed to detailed design and construction.
- 4.80 The procurement programme enables the HS2 Key Dates for the construction of Curzon Street Station to be met which include the handover to Rail Systems

for Track and other systems installation in September 2025 and then the handover to Operations in January 2028.

Birmingham Interchange Station

- 4.81 The Package Procurement Plan (PPP) for Interchange Station is currently being developed and a series of workshops are currently taking place to define the procurement and delivery strategy.
- 4.82 The opportunity to gauge overall appetite to bid for Interchange and/or Curzon Street is currently being tested. However, the approach to Interchange, especially its packaging strategy will ultimately be informed by targeted market engagement to be carried out specifically in relation to this station alone.
- 4.83 The strategy in the Category Procurement Plan outlines the use of the negotiated procedure under UCR 2016. HS2 Ltd will follow its standard assurance and then governance approval prior to issuing tender documents to the market.
- 4.84 The procurement programme enables the HS2 Key Dates for the construction of Interchange Station to be met which include the handover to Rail Systems for Track and other systems installation in October 2025 and then the handover to Operations in May 2027.

Railway systems

- 4.85 Across rail systems there are 6 packages from which 15 contracts will be procured which will cover Phase One (and Phase 2a as an option). The procurements will be phased to allow for the tendering to be conducted and for suppliers to respond to the contracts where their companies are best aligned to deliver services. The overall strategy is outlined in the Rail Systems category plan approved and updated in Q1 2019.
- 4.86 The review of the strategy included all the six packages of work which are: Track and Overhead Catenary Systems; Mechanical and Electrical Systems; High-voltage power supplies; Communications systems; Command and Control Systems (traffic management etc); and the rolling stock maintenance depot.
- 4.87 As discussed earlier, in 2018 the systems procurement was paused to reflect upon performance of current HS2 contract awards and changes in the construction sector.
- 4.88 The output of 40 workshops with the team and steer from HS2 Ltd Executive led to recommendations from the review:
 - It is the ambition of HS2 Ltd to provide certainty to the requirements in both programme and design. Where the programme is clear with a defined scope and with design at a more mature level, there is sufficient certainty for bidders to propose a Target Price with greater certainty in a single stage contract. HS2 Ltd is proposing to take greater accountability for the design maturity and therefore proposes to follow a single stage contract approach with a reduced tendering burden on the supply chain.

- The proposal recognises that there may need to be an extension to the original thinking which test some elements of the HS2 specification using multiple stages in the procurement. A tailored approach for each package will be considered as part of the individual procurement plans.
- There will be a segmentation of the 6 packages into various contracts which are lower in value. This facilitates greater competition at all Tiers of the supply chain.
- Overall, HS2 Ltd will take an active role in Systems and Construction integration and this will be communicated to the market reducing the risk the Suppliers have to price (in circumstances where they may not be in the best position to manage such risks) as part of the contracting process.

4.89 Several formal market engagements have taken place since 2016 to include written questionnaire responses and one-to-one meetings with interested supplier organisations. These have been re-conducted in 2018 to test the new strategy and the output was shared as part of HS2's assurance and governance process.

4.90 The Procurement plans that are being developed stem from the updated Rail Systems Category Procurement Plan. In all cases, a Negotiated procedure under UCR 2016 will be followed with a Pre-qualification system prior to an Invitation to Tender (for successfully pre-qualified entities). The contract type will be dependent on the package and contract, with the default for Rail Systems being a single-stage Design and Build contract. For some of the Systems, maintenance will be part of the procurement. Prior to approach to the market, Assurance of Procurement Package Plans and formal approval of the pre-qualification pack/questionnaire will occur. The programme for the procurements is as follows:

Rolling stock

4.91 HS2 high-speed rolling stock will interface directly with the rail systems, depots and control centres, but as importantly, the rolling stock will directly interface with the customer and contribute to the passenger experience traveling on the high-speed rail link.

4.92 In development of the strategy and the Category Plan, extensive market testing was undertaken on a substantial number of commercial and technical areas over the period of 2015 to early 2018. This combined with the in-depth knowledge of the team provided the confidence that HS2 Ltd's requirements, admittedly challenging, could be achieved.

4.93 The Category Plan and Procurement Plan which were approved in 2017 sought to take into account the high level of technical requirements HS2 Ltd has for the rolling stock. As such, the procurement demonstrates a five-stage evaluation model to achieve the most economically advantageous tender (MEAT). The stages are summarised below:

- Stage 1: submission of compliance with mandatory requirements covering Parent Company Guarantees and technical requirements.
- Stage 2 (Technical): This stage ensures that each Tenderer has a product offering that meets HS2 Ltd's technical specification. There are both mandatory items with which they must comply and non-mandatory items for which each Tenderer achieves a score where they comply. Evaluation thresholds are set for various parts of the technical specification to ensure an overall high level of compliance is achieved. In addition, there is a technical deliverability section where the Tenderers must demonstrate that they have understood HS2 Ltd's requirements and can demonstrate a level of design that meets such requirements with a need of Tenderers to achieve a score of 75 per cent.
- Stages 3 and 4 assess deliverability i.e. the ability of the Tenderer to deliver on its obligations covering key activities across the design, test and supply phase of the programme. There are also deliverability questions in respect of maintenance obligations (as the procurement is for both manufacture and subsequent maintenance) and the wider benefits aims of the HS2 programme such as skills education and employment. A series of evaluation thresholds that must be achieved to enable Tenderers to proceed to Stage 5 where the commercial submission is assessed.

4.94 The Stage 5 commercial submission is tested on a 35-year whole life cost basis which covers:

- Capital costs of the new fleet
- Maintenance costs, both planned and un-planned
- Energy costs, both on HS2 and Network Rail infrastructure
- Network Rail track access costs

4.95 Included in the assessment are incentives for providing higher seating capacity and lower external noise emissions. There are contractual protections to ensure the above are not gamed in the evaluation.

4.96 The procurement strategy required a two-stage process of prequalification and then invitation to tender. The extensive market engagement and pre-qualification process ensured healthy competition for the tender stage. The tendering exercise is still live with contract award due in 2020 to align with the Baseline 7 programme.

4.97 The resultant contracts from the procurement exercise are based on precedent terms and conditions and will be for the manufacture, supply and then maintenance (guaranteed for 12 years with options to extend) of the rolling stock fleet. During the manufacturing and supply phase of the contract, milestone payments are made against pre-defined activity deliverables e.g. design outputs, and then interim and final delivery milestones for build and acceptance. There is also liquidated damages regimes for late delivery and failure to achieve key performance characteristics such as energy consumption.

4.98 The terms and conditions follow industry standards for rolling stock contracts as precedents to optimise the commercial offer obtained by the market. The maintenance contract payments are fixed but can flex if fleet mileage alters from an assumed case (this is to reflect changes in mileage based heavy overhauls). The maintenance contract contains a performance regime to incentivise train reliability and availability. There is some tailoring of the terms to include provisions to retain flexibility for a later private financing. The rolling stock will be owned by HS2 Ltd or related entity until (if) private financing is invoked.

Governance and assurance

4.99 HS2 Ltd has an assurance framework in place (articulated by the Management Case) whereby Category and Procurement Plans are subject to three lines of defence (LoD) prior to requesting formal authority to enact the procurement strategy. The specific steps followed for procurement are outlined below. At each stage of the LoD review, comments are recorded in a tracker with actions taken to resolve and the actions to resolve also recorded.

- LoD1: A review of a senior responsible officer (a procurement director responsible for the output from the strategy)
- LoD2: A third party review conducted by a team separate to the originating team. This review can be performed by HS2 Ltd's internal assurance team or an external resource.
- LoD3: For procurements, the independent assurance panel (IAP) review and make recommendations on the papers submitted. All documentation in support of the procurement pass through the three lines of defence for contracts over £100m.

4.100 Following the report received from IAP and having satisfactorily addressed any comments from LoD reviews, the papers are submitted through HS2 Ltd governance (which depends upon the value of the contract to be awarded). If the contract is of substantial value, this includes the Commercial Investment Panel and Committee (CIP and CIC) and onto the HS2 Board.

Contract management strategy

4.101 For each contract, as part of the preparation for tendering, a contract management plan (CMP) is put in place. The CMP passes through its own assurance cycle as outlined by the three lines of defence (as above). The CMPs are owned by the HS2 Ltd commercial team, who support the management of the contract to deliver the value articulated by the supplier through the tendering cycle. Contract management plans were put in place for EWCs and MWCCs and, as they were geographically arranged packages, are managed accordingly.

- EWCs: for EWCs, each work package is defined by the HS2 Ltd Project Manager against a need to support the MWCC or Stations or Rail Systems schedule of works. The EWC provides an estimated cost and schedule for the works, which, once agreed, forms a work package under the EWC contract.

- MWCCs: for Stage One of the MWCCs, six Gateways were defined against which to measure and control progress towards an agreed target price for Stage Two. The evolution of the contract through these Gateways is covered in the ‘Awarded Contracts’ section above. To create an effective contract management approach for Stage Two with the necessary team structure and appropriate behaviours and agility of decision-making, close integration is required between HS2 Ltd and the MWCCs. This has been developed through the creation of IPTs (see Management Case for details).

- 4.102 The purpose of integrated delivery is to bring the client closer to the contractor in order to manage the risk proactively, maximise resource efficiency and increase the speed of decision making.
- 4.103 The new IPT organisations are being “stood up” and it is intended that they are ready, both technically and behaviourally, to deliver within this framework by issue of NtP to full construction for civils.

5. Management Case

5.1 As main civils construction works commence the Department intends to make significant changes to the oversight, scope, internal governance and control of HS2 Ltd to improve delivery confidence and cost control. The Oakervee Review has also made recommendations in this space. This would include:

- **Increasing the focus of HS2 Ltd, by reducing its scope of activity:** this may include putting in place a different delivery model for works at Euston, which could also help drive better integration with Network Rail's plans and unlock value for the taxpayer from the site.
- **Improving the capability and capacity of HS2 Ltd, including its Board and Executive:** this will include the appointment of at least three further Non-Executive Directors (NEDs) to bring in new challenge and leadership. Two of the NEDs would be nominated directors, to represent the Government's interests more effectively and to act as a direct link back to the Department. HS2 Ltd intends to make changes to its Executive to reflect the delivery model following NtP.
- **Strengthening Government oversight and leadership:** this includes the appointment of a full-time HS2 Minister, who will chair an inter-departmental committee to oversee delivery of benefits and to help hold HS2 Ltd to account for progress against scope and schedule.
- **New controls on access to financial and schedule contingency:** this would allow HS2 Ltd some operational discretion but provide proper early warning and control if costs and schedule begin to deteriorate. There would also be a fresh commitment to reporting to Parliament, every six months, on the basis of a report from the Chair of HS2 Ltd to the Secretary of State.
- It is also essential that the lessons from Phase 1 are identified and implemented on Phase 2, including in areas such as standards, design, cost control, parliamentary handling strategy and procurement.

Overarching delivery context

High Speed Rail (London – West Midlands) Act 2017

- 5.2 The High-Speed Rail (London – West Midlands) Act achieved Royal Assent in February 2017. The Act authorises the construction of specific works for HS2, and confers powers to acquire land and property compulsorily, and use it for the purposes of constructing and operating HS2. It includes various further powers relating to highways, including in relation to access, interference, construction and maintenance. The Act also contains provisions which regulate how HS2 will integrate with the existing rail network and regulatory regime.
- 5.3 The Act grants deemed planning permission for the railway, similar to an outline planning consent, and establishes a bespoke planning regime which gives

qualifying local authorities a role in approving certain construction matters and the design of permanent structures in their areas.

- 5.4 The Act sits alongside a set of Environmental Minimum Requirements (EMRs) which set out the environmental and sustainability commitments that will be observed in the construction of Phase One. They are overarching environmental controls on the programme which HS2 Ltd and its contractors are contractually obliged to comply with. The EMRs comprise a suite of documents, including the Code of Construction Practice, the Environmental Memorandum, the Planning Memorandum and the Heritage Memorandum. The EMRs also include a range of undertakings and assurances that were entered into during the passage of the Act through Parliament.

The Department for Transport

- 5.5 The Department for Transport (the Department) is the Sponsor of the HS2 programme, responsible for setting the policy framework for the programme, for securing the funding, and for ensuring that the benefits are realised. The HS2 programme is led by the Department's Director General for High Speed and Major Rail Projects (HSMRP), who is also the Senior Responsible Owner (SRO).
- 5.6 HS2 is a Government Major Project Portfolio (GMPP) programme and as such, the SRO has been appointed by the Department's Permanent Secretary and Infrastructure and Projects Authority (IPA) Chief Executive.
- 5.7 The SRO is held personally accountable to Parliamentary Select Committees and is expected to account for and explain the decision and actions taken to deliver the programme (or specific milestones).
- 5.8 The SRO is supported by four directors in the High Speed and Major Rail Projects Group within the Department; the Phase One Director, the Euston Director (to be appointed) the Phase 2 and NPR Director and the Director of Programme Integration. HSMRP Group is responsible for sponsoring the delivery of a portfolio of the largest and most transformational of the Department's infrastructure programmes; HS2 (all Phases), East West Rail (EWR), Northern Powerhouse (NPR) and Crossrail 2 (CR2).
- 5.9 HSMRP Group specialises in major project sponsorship and specific responsibilities for project sponsors are set out in the Sponsor's Handbook which is provided and available to all staff.

HS2 Ltd

- 5.10 HS2 Limited is a corporate body established on 14 January 2009 by incorporation under the Companies Act 2006, and limited by guarantee. It is an Executive Non-Departmental Public Body tasked with delivering the HS2 programme and is funded by capital contribution from the Government. The Secretary of State is its sole member, for whom it is remitted to undertake work. HS2 Ltd is a separate legal entity from the Crown and is therefore not a Crown Body.

5.11 HS2 Ltd is overseen by the HS2 Ltd Board. The Chairman of the HS2 Ltd Board is responsible for ensuring that HS2 Ltd fulfils the aims and objectives agreed with the Department and the Secretary of State and operates in accordance with HS2 Ltd's Framework Document and the Development Agreement. The Chair of the company and its Non-Executive Directors are appointed by the Secretary of State. As part of our work to strengthen HS2 Ltd's capability, we intend to appoint at least three further Non-Executive Directors to both bring new challenge and leadership while also representing the Government's interests more effectively.

5.12 The Chairman appoints the Chief Executive of HS2 Ltd to manage the organisation, report to the Board on the performance of the company, and on the development and delivery of the railway. The Chief Executive is supported by an executive team of directors, who have specific responsibilities within the organisation for particular aspects of the programme.

5.13 HS2 Ltd's Executive Committee, chaired by the Chief Executive, manages the company's day-to-day business. It meets weekly to review and take decisions on both the HS2 programme and internal company management issues.

Other parties

5.14 The High-Speed Rail (London – West Midlands) Act 2017 provides HS2 Ltd the powers to carry out HS2 works. These works affect the infrastructure, apparatus, facilities and land of several statutory undertakers. Statutory undertakers have an obligation to fulfil their duties, and HS2 Ltd cannot prevent them from doing so. The Secretary of State has therefore entered into a series of Protective Provisions Agreements which govern how the Department and HS2 Ltd, as Nominated Undertaker under the Act, interact with statutory undertakers regarding the delivery of HS2. These agreements set out the processes that HS2 Ltd must follow before carrying out works which affect a statutory undertaker. Protective Provisions Agreements are in place with Transport for London (TfL) and Network Rail, as well as energy, telecoms, oil and water companies.

5.15 In addition to having statutory responsibilities, Network Rail and TfL are important delivery partners for the HS2 programme. HS2 Ltd and the Department have agreed an Implementation Partnership Agreement with Network Rail to establish processes and governance for joint working to deliver key programme elements. In the case of TfL, a series of management processes have been established to ensure effective joint working.

Delivery of the Euston project

5.16 The Oakervee Review concluded, and the Government agree that, Euston is an important part of realising the benefits of HS2 and that work should continue on the section from Old Oak Common to Euston. Notwithstanding this, Euston is a very challenging, complex major programme and given its current status, Old Oak Common will be expected to operate as a temporary terminus for a period of time.

Delivery of Phase 2a

- 5.17 Phase 2a extends the Phase One section of railway from Fradley to Crewe. At some point in the future the two phases will be brought together but the timing is uncertain as they are at different stages; Phase One is ready to start construction, whereas Phase 2a is currently seeking powers to construct the new railway.
- 5.18 Following Royal Assent, which is subject to Parliamentary timescales, HS2 Ltd will undertake environmental surveys, environmental mitigation works and enabling works, such as enhancing road junctions to enable construction traffic to gain safe access to the line of route in rural Staffordshire.
- 5.19 In addition, lessons have been learnt from Phase One in the procurement of the Main Works Civils contracts. Much more design work has been undertaken for Phase 2a compared with Phase One and significant investigations into the ground conditions (c.1,400 boreholes, of which c.800 have been completed to create a Geotechnical Baseline before tendering) have taken place. HS2 Ltd and the Department continue to actively consider how to implement contracting lessons from this stage of Phase One to future Phases of the scheme.
- 5.20 Once the Main Works Civils contacts have been completed, there will be integration of the two Phases as the Phase One Rail Systems suppliers will continue their works for Phase 2a.

Delivery of Phase 2b

- 5.21 Government published the Terms of Reference for an Integrated Rail Plan for the North and the Midlands in February. This work will consider the scope and integration of HS2, NPR, Midlands Rail Hub and other major rail schemes, together with the delivery mechanisms for those schemes. The work will involve inputs from Northern and Midlands leaders.
- 5.22 As one of the inputs to the Integrated Rail Plan, the Infrastructure and Projects Authority (IPA) will conduct a review of the lessons of HS2 Phases 1 and 2a for delivery of the project, particularly Phase 2b.

Control framework and governance

- 5.23 An effective control framework is required to ensure clarity around roles and responsibilities between the Department and HS2 Ltd, and around the requirements for developing, delivering and operating the railway.

The Development Agreement

- 5.24 [The HS2 Development Agreement](#), stipulates and governs the delivery arrangements for the HS2 programme.

The Framework Document

- 5.25 [The HS2 Framework Document \(FD\)](#) governs the corporate relationships and corresponding control frameworks within which HS2 Ltd operates.

The Sponsor's Requirements (SR) and Functional Response (FR)

5.26 A key feature of the Development Agreement is the Sponsor's Requirements (SR) which set out the Department's high-level requirements for the Core Programme to be delivered by HS2 Ltd. These are included at Annex 2 of the Development Agreement, and the high-level themes that they cover are set out below:

Table 5.1: High-level themes of the Sponsor's Requirements

Route and stations	Safety	Passenger capacity	Journey times	Infrastructure capability
Reliability	Passenger experience	Revenue	Operations and maintenance	Integration with the existing network
Wider benefits realisation	Architectural Design	Integration with other transport modes	Sustainability	Minimisation of Adverse impacts
Security	Compliance with standards	Commercial and operational flexibility	Cost	Time

5.27 Also annexed to the Development Agreement is the Functional Response (FR) which is prepared by HS2 Ltd and sets out the capabilities it will satisfy to deliver the SR. The FR is set out in Annex 3 of the Development Agreement. Both the SR and FR are subject to change control under the Development Agreement. Within HS2 Ltd, the FR determines the content of the Project Requirements Specification (PRS), which sets out at a more detailed level the constituent parts of the Programme

Use of baselines in the Development Agreement

5.28 The Department uses baselines to maintain oversight of the programme and control change. Baseline 7.1 is the most recent version of the baseline cost model and baseline delivery schedule. More detail on Baseline 7.1 can be found in the Financial Case.

5.29 In addition to cost and schedule, the Development Agreement also requires a baseline operational cost model which is used for economic modelling, for reviewing value-for-money decisions requiring capital and operational expenditure trade-offs and as a baseline for the West Coast Partnership to consider operational options.

5.30 Finally, the Development Agreement includes a benefits baseline which sets out what benefits are being measured, the metrics to be used and the starting point and target for each metric.

5.31 HS2 Ltd has delegated authority to manage the programme within agreed levels of tolerance on its baselines without recourse to the Department. Each baseline is subject to change control such that any proposed change outside of these

parameters, proposed by either HS2 Ltd or the Department, must be subject to a full change appraisal before it is agreed. Remedies are available under the HS2 Development Agreement should there be variations from the baseline, outside of the agreed bands of tolerance.

Ministerial oversight

5.32 A new Ministerial HS2 Committee will be established to provide a dedicated means for Government to oversee delivery of the programme.

5.33 The Board will ensure tight management of the programme including challenging cost and schedule pressures, overseeing change, and the delivery of wider programme benefits.

Governance in the Department

5.34 Within the Department, major investment decisions are taken by the Investment, Portfolio and Delivery Committee (IPDC, formerly BICC) which considers all investment decisions over £100m. The HSMRP Tier 2 Investment Board, considers investment decisions below £100m. IPDC also monitors programme progress and performance through Tier 1 portfolio-level reporting

5.35 The Department has established several forums to set primary policy and strategy for the wider HS2 programme and to monitor and oversee the performance by HS2 Ltd of its obligations under the Development Agreement. A Shareholder Board is also in place to oversee HS2 Ltd's corporate performance, in relation to the control framework as set out in the HS2 Framework Document.

5.36 Additional forums such as the Tripartite Co-operation Board and the One Railway Programme Board oversee the relationship with Network Rail and the Department's management of HS2's integration with the wider conventional rail network.

5.37 To support formal governance, regular bilateral meetings are held between the Department and HS2 Ltd to discuss progress against plans, issues and risks. These include quarterly meetings between the Secretary of State and the HS2 Ltd Chair, and monthly meetings between the SRO and the HS2 Ltd Chief Executive.

Governance in HS2 Ltd

5.38 The HS2 Ltd Governance Policy sets out HS2 Ltd's Corporate Governance and the control regime through which HS2 Ltd makes decisions. Because of the evolving nature of HS2 Ltd's activities, the regime is reviewed at regular intervals to ensure that it is fit-for-purpose.

5.39 HS2 Ltd's principal governance forums include:

- HS2 Ltd Board and its sub-committees:
 - Audit and Risk Committee
 - Commercial and Investment Committee

- Health Safety and Environment Committee
- Nominations Committee
- Remuneration Committee
- Executive Committee and its sub-committees:
 - Audit and Risk Assurance Panel
 - Commercial and Investment Panel
 - Health Safety and Environment Panel
 - People Panel
 - Programme Review
 - Infrastructure Panel (including Systems Review Panel)
 - Land and Property Board

5.40 The HS2 Ltd Board is the most senior HS2 Ltd decision-making body. It is responsible for HS2 Ltd's aims, goals and objectives and ensuring these are achieved. The Board holds the Executive to account for the day-to-day performance of HS2 Ltd.

5.41 In 2019 the HS2 Ltd Board comprises the Chair, three Executive Directors (two of which are currently in place) and five independent Non-Executive members. The Non-Executive Directors of the Board are appointed by the Secretary of State for Transport as sponsor and sole shareholder of HS2 Ltd. The Chairman and the Non-Executive Directors are independent Directors. One Non-Executive Director has been appointed a Senior Independent Director. The Chief Executive and Chief Financial Officer are Executive Directors.

5.42 The Government will strengthen the HS2 Ltd Board with representation from HM Treasury and the Department, to ensure its efforts are fully aligned with the Government's priorities and to challenge its effectiveness.

5.43 The Chief Executive of HS2 Ltd is the designated Accounting Officer and is personally responsible for safeguarding the public funds for which he has charge, for ensuring propriety, regularity, value-for-money and feasibility in the handling of those public funds, and for the day-to-day operations and management of HS2 Ltd. He is required to ensure that HS2 Ltd is run on the basis of the standards, in terms of governance, decision-making and financial management, that are set out in the principles of HM Treasury's Managing Public Money.

Corporate planning

5.44 Under the Framework Document, HS2 Ltd is required to submit a Corporate Plan to the Department each year.

5.45 The Corporate Plan covers the following three years, and addresses how HS2 Ltd contributes to the achievement of the Department's priorities relating to high

speed rail, and how the HS2 railway will be delivered, including key performance indicators for the period covered.

- 5.46 The first year of the Corporate Plan informs the business plan for the following 12 months, including key targets and milestones for the year ahead linked to budgeting information so that resources allocated to achieve specific objectives can be readily identified by the Department, including numbers of HS2 Ltd staff.
- 5.47 The latest Corporate Plan was published on 18 July 2019 and sets out HS2 Ltd's key performance indicators relating to cost, schedule, health and safety, acquisition of Land and Property, Equality, Diversity and Inclusion (EDI) scores and acting as a good neighbour.

Business planning

- 5.48 Under the Framework Document, HS2 Ltd is also required to submit a Business Plan to the Department each year. The Business Plan must be submitted in draft and covers financial activity for the subsequent financial year. The Business Plan must be agreed by the HS2 Ltd Board as well as detailing the approved funding provision, setting out a budget of estimated payments and receipts, including how this will be drawn down over the financial year.
- 5.49 In the light of consideration of the draft business plan and budget, and decisions by the Department on the updated draft Corporate Plan, the Department will then issue each year a formal statement of the annual budgetary provision allocated by the Department in the form of a Financial Delegation Letter.

Programme integration (including Phase 2)

- 5.50 Programme Integration in the HS2 programme has several meanings:
- Integration of scope, cost and schedule to deliver the Sponsor's Requirements on time and within the agreed budget.
 - Integration of the Phase One programme with Euston, Phases 2a, 2b and Northern Powerhouse Rail to align all elements of HS2, including stations, civils, rail systems and rolling stock, to deliver a railway that operates in line with the Sponsor's Requirements and passenger expectations.
 - Integration with the existing rail network.

5.51 Within HS2 Ltd, given that all three Phases are at different stages in the programme lifecycle, and that each is a complex programme, the day-to-day management of Phase One is separate from Phases 2a and 2b. To ensure integration across phases, accountability for all pan-phase activity including the role of Technical Authority, specification and procurement of rolling stock, and accountability for systems integration, sits with the Infrastructure Directorate. In addition, all Corporate Functions (including Finance, Sponsorship, and Human Resources) are provided centrally to ensure consistency across the programme.

5.52 As Phase 2a moves from development to delivery with Royal Assent of its Hybrid Bill in 2020, the day-to-day management will be brought in line with the

delivery of Phase One to ensure consistency and the application of relevant lessons from Phase One.

5.53 Within the Department, there are many interfaces within the whole HS2 programme as well as with the existing rail network and other proposed rail infrastructure programmes such as NPR, East-West Rail and, potentially at Euston, with Crossrail 2.

5.54 The One Railway Programme Board operates within the Department to ensure that key interfaces are identified and successfully resolved between major new rail programmes and the existing railway, including other rail enhancements projects and franchising activities.

Programme and project management

5.55 HS2 Ltd has clear programme and project management processes which cover the establishment of the baselines, assurance, contract management, information management and reporting, risk and issue management, change control, stakeholder management and operational resilience.

Establishment of the baseline

5.56 The baseline creation control framework sets out how HS2 Ltd establishes and updates the programme baselines. Eight governing controls define how the baseline is created, with the first step to agree the scope upon receipt of the Department's instruction, prepare a Project Execution Plan and then create a Methodology Statement. The steps that follow include building the Schedule and Cost Plan and carrying out the quantitative risk assessment. The key output is a Baseline Executive Summary Report.

5.57 The final Baseline Executive Summary Report is submitted to the HS2 Ltd Executive and Board in support of approval of a new or revised baseline. This provides a summary of the key baseline findings with supporting commentary and analysis of all Baseline Products, including assurance, the basis of estimate, basis of schedule and others.

5.58 As part of this FBC, the Department has adopted the latest baseline into the Development Agreement.

Assurance

5.59 As is best practice on GMPP projects, HS2 Ltd adopts an industry standard Three Lines of Defence assurance model: Operational Assurance (LoD1), Management Assurance (LoD2) and Strategic Assurance (LoD3).

5.60 Assurance activities are specified, planned and tracked in Integrated Assurance and Approvals Plans (IAAPs). The HS2 Integrated Assurance Group (IAG), an integrated group where HS2 Ltd, the Department, P-Rep and IPA are represented, is the forum within which the IAAPs are developed.

5.61 The Department employs its own external specialist assurance advisors, the HS2 Programme Representative (P-Rep). The role of P-Rep is to provide

assurance to the Department that the programme is being delivered in a way that meets its requirements, maximises benefits, is affordable and offers value-for-money. This role is defined in the HS2 Development Agreement and HS2 Ltd is contractually obliged to co-operate with, and respond to any reasonable request for information by P-Rep.

- 5.62 P-Rep produce monthly reports highlighting issues and recommendations for the SRO, as well as briefing notes which are distinct pieces of work formally commissioned by the sponsor teams for advice and/or assurance on a specific issue, which is normally provided in a separate note or report.

Business case assurance

- 5.63 As is the case for all projects in the Department's capital portfolio, the five-case business case model for HS2 is also subject to assurance by the Department's Centres of Excellence prior to approval by IPDC. The comments provided by the Centres of Excellence are submitted to IPDC alongside the business case.

Management information

- 5.64 A key element of the Department's governance and control framework is the provision of quality and timely management information, so that adverse trends can be identified early and swift interventions able to be taken to ensure the programme remains on track. HS2 Ltd is responsible for the production of management information for the HS2 programme, as required by the HS2 Development Agreement, drawing on best practice from other successful capital programmes. HS2 Ltd produces a monthly delivery report which contains information on performance against cost, schedule and benefits targets, alongside risk and trend information.

- 5.65 The monthly delivery report is reviewed by the HS2 Ltd Chief Executive and colleagues at a monthly Programme Review meeting. The Programme Review focuses on performance in terms of Earned Value Management, programme milestones, spend to date and estimated cost at completion. Progress, risks and issues are reported and appropriate mitigations established where required.

- 5.66 Following the Programme Review, the Delivery Report is submitted to and reviewed by HS2 Ltd's Board and the HS2 Client Board.

- 5.67 During 2019, HS2 Ltd has undertaken a project, known as Project Atlas, to improve the consistency of programme data through a process of quality management and automation. The improved reporting process was implemented in late 2019 alongside training of all relevant HS2 Ltd staff and further improvements are planned for 2020.

Transparency

- 5.68 On a project of the scale and complexity of HS2, challenges will arise during the course of delivery. Secretary of State for Transport, Rt. Hon Grant Shapps MP indicated to Parliament in September 2019 that, "I want to be clear with colleagues that there is no future for a project like this without being transparent

and open, so we will be candid when challenges emerge". The Department is committed to being transparent and open with Parliament, stakeholders and members of the public.

5.69 The Oakervee Review similarly found that Government and HS2 Ltd should be more transparent and open about the progress of the project, including where there are challenges. He recommends that "on a regular basis, the Secretary of State for Transport should, upon receipt of a report from the HS2 Ltd Chair, advise Parliament on the project's progress especially in relation to costs". Following on from the publication of the FBC, it is expected that Ministers will make regular statements to Parliament.

Change management and control

5.70 The high-level outputs and activities which the Secretary of State requires HS2 Ltd to deliver are set out in the Development Agreement and its annexes (in particular the Sponsor's Requirements, the Baseline Delivery Schedule, Baseline Cost Model, Baseline Operational Cost Model and the Benefits Baseline).

5.71 Changes to any of the products defined in the Development Agreement are subject to the instruction and change procedures documented in the Development Agreement. This change control procedure requires any implications of a change on the wider programme including operating costs and benefits as well as any financial implications to be clarified and considered before the change is confirmed.

Risk management

5.72 Risk management in both the Department and HS2 Ltd is based on standard industry and project portfolio management (PPM) best practice. Both organisations are responsible for the identification, analysis and management of risk. Risks are identified through specific risk identification workshops, from studies, from the supply chain and on an ad-hoc basis. Risks are reviewed as part of a monthly cycle that includes a formal risk review meeting to approve new risks, ownership changes, mitigation actions and focus areas. Risks are initially assessed qualitatively for both their current likelihood and consequences and this assessment is used to prioritise risk mitigation effort. Risk management is not limited to the monthly cycle however, and risks are identified, assessed and mitigated as and when they arise without waiting for a formal risk meeting to do so.

5.73 In principle, risks are owned by the individual or organisation best able to manage them and as such may be delegated or escalated as necessary. In some cases, where work scope is provided by the supply chain, risks may be contractually owned by other entities. Where this is the case it is recognised that residual risk impact may reside with the Department or HS2 Ltd even if the risk is transferred. Close liaison between the Department and HS2 Ltd is maintained to ensure visibility of risks.

5.74 HS2 Ltd's approach to risk management focusses on the breadth of risks affecting HS2 development and delivery. It considers risks both as threats to be managed and opportunities to be exploited, as well as issues that require immediate consideration. It stresses the importance of risk identification and management being a part of the everyday work of everyone involved in the HS2 programme.

5.75 HS2 Ltd's appetite for risk is summarised in the Risk Appetite Statement. A HS2 Risk Scoring Scheme defines appetite and tolerance thresholds for risk escalation based on probability and impact criteria of all types (cost, schedule, reputation etc) based on the Appetite Statement.

5.76 Reporting on the status of top risks (nominally the "top 10") is provided by each area of the business in its standard reporting. The top risks for reporting are assessed by their current risk rating. Other considerations such as forecast assessment, proximity or level of control are also considered.

5.77 The HS2 Ltd Audit and Risk Assurance Panel (ARAP):

- Assures the company's risk appetite relating to major programme activities (e.g. Baseline Cost Models Baseline Delivery Schedules and any company-wide improvement programmes).
- Undertakes risk deep dives as and when requested by the Executive Committee, Audit and Risk Assurance Committee or HS2 Ltd Board.
- In relation to corporate risks and strategic risks: reviews trends, any relevant data in HS2 Ltd's Management Information and identifies further actions where required.

5.78 The Department's approach to risk management focusses on strategic risks to the success and objectives of the HS2 programme. The HS2 Development Agreement also sets out that there are risks held by the Department (Secretary of State retained risks) which HS2 Ltd is not able to manage within its own control or resources. These are principally force majeure risks (e.g. armed conflict) although some Secretary of State retained risks reflect that the HS2 programme interfaces with the existing transport network, which the Department is responsible for.

5.79 The Department's risks are monitored by the SRO at a monthly Senior Leadership Team meeting to assess changes, risk exposure and management actions. Risks at or above an exposure of 20 out of 25 are escalated to the Executive Committee for review. HS2 Ltd's risks are monitored through the management information review at the monthly Client Board. Close liaison between the Department and HS2 Ltd is maintained to ensure visibility of risks.

Stakeholder engagement and management

5.80 HS2 Ltd's Stakeholder Engagement Directorate owns the strategic and community engagement plan, processes and standards used across HS2. This ensures a consistent and aligned approach across the route.

- 5.81 There are thousands of stakeholder relationships to be managed as a part of HS2 Ltd's work. Many of these have multiple points of contact within HS2 Ltd due to the wide range of areas to which they relate. HS2 Ltd points of contact often have limited awareness of other connection points or engagement that may overlap with theirs. It is appropriate to ensure coordination measures support continued tailored engagement, through corporate arrangements that provide clarity of roles and responsibility to enable consistency of information and action.
- 5.82 Given the scale and variety of stakeholders, objectives and points of contact involved, staff managing stakeholder relationships are supported by a structured approach at multiple levels.
- 5.83 To establish a clear approach to stakeholder relationship management a stakeholder identification and mapping exercise was conducted with members of the Stakeholder Managers Network. The exercise focused on stakeholders that would benefit from coordination efforts either due to sensitivity of the relationship or because of multiple connection points and requirements with HS2 Ltd.
- 5.84 In HS2 Ltd's revised operating model, greater levels of stakeholder engagement will be delivered at a local level, taking a balanced view of strategic importance and risk of different stakeholder groups associated with the programme. This includes clearly defined accountabilities for stakeholder engagement to be fulfilled within construction, including Integrated Project Teams (IPTs) and the supply chain. As per other corporate functions, expertise is provided to support execution of this in delivery and the stakeholder management approach set out above will be refined to ensure effectiveness in the revised operating model.

Resilience and contingency planning

- 5.85 Within the Department, HSMRP Group are committed to maintaining the safety and security of all its staff, visitors, information, buildings and other assets from serious disruption and to continued delivery of key services to the public and external stakeholders. Proportionate preparedness and resilience have a vital role to play in the overall success of the Department and its ability to support the resilience of the wider transport sector. The Department's business continuity arrangements are designed to reduce the risk of disruption and maintain stakeholders' confidence in its ability to deliver its business objectives effectively and efficiently.
- 5.86 HS2 Ltd has a high-level Business Continuity policy that details how Business Continuity capability will be delivered across the HS2 programme, aligned to recognised standards and best practice.
- 5.87 Because of the dynamic nature of the organisation, HS2 Ltd has chosen not to create local business continuity plans across the business, instead creating these at a corporate level to ensure that any response is always aligned with organisational priorities. HS2 Ltd's Business Continuity Management

System, ClearView, establishes the most critical parts of the organisation and ensures that plans are in place for these to continue during times of disruption.

5.88 HS2 Ltd's Security and Resilience Team is responsible for defining and delivering a security and resilience strategy that ensures its people, offices and physical and information assets are protected from harm, theft, loss or intimidation and that HS2 Ltd is resilient to incidents, disruption or changes.

5.89 The HS2 Ltd Incident Management Framework establishes clear processes to respond to incidents should they occur. The framework ensures that incidents are managed at the most appropriate level, from a local response team for smaller incidents, to an Incident Management Team for larger incidents, and for the most severe incidents a Crisis Management Team.

Controls and delegations

Existing delegations framework

5.90 HS2 Ltd's delegations are derived from many sources but principally derive from the Development Agreement (Operational Delegations annex), the Framework Document (for corporate delegations such as pay) and the annual financial delegation letter from the SRO to Chief Executive (covering annual budget allocations).

5.91 The key project delegations as set out in the Operational Delegations annex are divided into four types:

- Financial
- Procurement
- Changes to the Baseline
- Contract Variation

5.92 The following section sets out how these delegations are intended to work post NtP.

Proposed delegations

Proposed financial delegations

5.93 The proposed delegation framework for HS2 Ltd contingency is intended to incentivise delivery-into-service of Phase One within the Target Cost.

5.94 HS2 Ltd will be able to retain and re-use any savings identified from base costs or from project contingency, up to an agreed delegated level. This approach was applied in the 2012 Olympic Games programme and incentivised project managers to identify and generate savings, and do so earlier than would have been the case otherwise.

5.95 The remaining amount of contingency above the Target Cost, up to the Funding Envelope total is allocated to HMG and is only to be released if stringent conditions are met. This will include all reasonable efforts by HS2 Ltd and the

Department, as well as other relevant bodies, to predict and prevent risks arising.

Procurement, Change and Contract Variation

5.96 A new delegations regime for Phase One has been introduced to reflect the move from the design stage to the construction stage of the programme. This will incorporate bespoke and appropriate procurement and change delegations (on cost and schedule). The new arrangements will take account and carefully balance the need for operational autonomy for HS2 Ltd against the need for Government to apply appropriate controls and scrutiny to the programme. These changes will form the basis of a new operational annex in the Development Agreement.

Controls on HS2 Ltd following Notice-to-Proceed

5.97 A revised set of control arrangements between the Secretary of State and HS2 Ltd will be provided in an update to the HS2 Development Agreement due to be published later this year. It will reflect the move from scheme development to construction of the line of route.

Schedule

5.98 As part of its work on Baselines 7 and 7.1, HS2 Ltd has also updated its Baseline Delivery Schedule. The schedule dates represent the earliest feasible DIS for Phase One. This is based on the cost point estimate and assumes no risk exposure beyond the contingency provision for handover between the MWCCs and Systems that is agreed in the MWCC JV contracts.

Table 5.2 – Summary of Baseline 7.1 earliest schedule

Earliest Delivery in Service schedule	Phase One Services between Old Oak Common and Birmingham Curzon Street (at least 3tph)	Opening of Euston Station and Phase One services from London to the North West (10tph)
Baseline 7.1	November 2029	December 2030

Managing schedule contingency

5.99 The schedule estimate is based on an estimate of the time taken to undertake the required activity. Amounts of contingency are applied which reflect underpinning assumptions on the potential for risks to materialise which can result in these activities taking longer than expected. Assumptions on schedule contingency can be determined through similar methodological approaches as are used for cost contingency.

5.100 The Department therefore proposes to set HS2 Ltd a target of delivering the programme within a publicly stated range informed by QSRA and schedule RCF analysis (presented in table 5.3 below). HS2 Ltd will be delegated schedule

contingency relative to their QSRA P80 analysis (presently 2030) and the Department will manage contingency beyond this. This approach is aligned with the “Lessons from transport for the sponsorship of major projects” report produced by the Department and IPA.

Table 5.3: Target opening ranges

Phase One service	Opening range
Old Oak Common to Birmingham Curzon Street	2029 – 2033
London Euston to North West	2031 – 2036

Benefits realisation and evaluation

Benefits management strategy

5.101 The opportunity for HS2 stretches beyond the immediate railway, delivering integrated transport benefits, as well as creating a step-change in local growth along the route. The development of a Benefits Management Capability will support the Department’s delivery of the full range of benefits.

5.102 The Benefits Management Capability covers both the core Programme Benefits, delivered through the direct investment in HS2, and the Wider Programme Benefits, which require additional investment, such as new housing and wider regeneration.

5.103 The Department’s approach to delivering these benefits is structured around five principles, which directly address the lessons learned from other major infrastructure projects and will drive the ability of the programme to realise benefits:

- Principle 1 - Accountability and responsibility are close to delivery - The parties responsible for delivering the individual activities required to realise the programme’s benefits are clearly defined.
- Principle 2 - Benefits-led decisions - Decision-making which aims to optimise the overall benefits from the Core and Wider programmes.
- Principle 3 - Continuous improvement - The programme continuously seeks opportunities to deliver improved value-for-money.
- Principle 4 - Benefits-led performance - The realisation of benefits is at the heart of the programme’s performance management.
- Principle 5 - Regular monitoring - Benefits reporting and tracking to ensure benefits are fully realised.

5.104 The Programme has seven Strategic Goals which set out the rationale for HS2 and how it will be delivered. The Benefits Register, is a register of the benefits that will be actively managed by HS2 Ltd. Each benefit on the register is linked to a Strategic Goal.

Figure 5.1: HS2 Seven Strategic Goals



5.105 Beneath the Benefits Register is the benefits baseline, which summarises the targets and benchmarks to which the programme is committing, acting as a base to assess the impact of changes and options for delivery and enabling the Department to track progress against delivery. Progress against the profiles are reported to the HS2 Programme Board bi-monthly.

Evaluation

5.106 There is a considerable overlap between Benefits Management and Evaluation. While Benefits Management Capability will set the approach for realising those benefits that can be actively managed, the Evaluation Framework will set out the approach to evaluation so that the impacts of the investment can be understood. This will include both benefits that are actively managed as part of the HS2 programme as well as those that we expect HS2 to contribute towards, but which are not suited to management through the HS2 programme (e.g. productivity impacts).

5.107 The Department will ensure that the work on Evaluation is joined-up with Benefits Management. Benefits Management will collect data that supports Evaluation, while Evaluation offers the potential to develop further methodological approaches. Together, they can provide a stronger evidence base.

5.108 Within the HS2 programme the Department is developing an approach to Evaluation that builds upon its approach to Benefits Management. This will

provide lessons for future phases of HS2, other major rail and transport programmes and non-transport infrastructure projects. It will also help to enable Government and HS2 Ltd to effectively communicate the benefits to the public and other stakeholders.

Organisational capability

5.109 As HS2 approaches NtP on the major civils works for Phase One, it is important that both the Department and HS2 Ltd demonstrate they have the organisational capability to deliver the programme in its new phase.

Department capability

5.110 The Department has been working on driving up its own capability, to ensure it is equipped to sponsor the programme once NtP is awarded.

5.111 The GIAA undertook a baseline capability assessment which was finalised in June 2018 against a sponsor competency framework, drawn from PwC's Capital Project Delivery Framework and with reference to the [IPA's Project Initiation Routemap Handbook](#). The assessment methodology involved:

- A self-assessment by HSMRP's senior management team, to develop an evidence-based internal assessment of maturity against sponsorship components;
- An in-depth review of key governance documents;
- A facilitated workshop and structured feedback with the senior management team and interview with key stakeholders to review the findings and actions.
- The findings are set out in Table 5.4 below.

Table 5.4: Findings of GIAA baseline capability assessment

Medium priority	Low priority
There is a lack of clarity in HSMRP's role and operating construct.	Stakeholder management and communication is considered to require more structure.
Gaps and uncertainty exist in relation to the capability and capacity of HSMRP Group.	Lessons are being learned and utilised, however, there is a lack of a systematic approach to 'lessons learned'.
Policies and processes exist but instances were noted where they may not be sufficient to guide Sponsor action.	
A clear change control process is outlined in the Development Agreement; however, this is not consistently followed.	
Controls are in place to identify interdependencies within the HS2 programme and between HS2 and the wider HSMRP Group agenda, however, their effectiveness is debated.	
General uncertainty around HSMRP Group's role in providing 'Assurance'.	

5.112 Against each of the findings a management response/action was agreed by GIAA and HSMRP and a 'Follow-Up' report undertaken by GIAA in February 2019. This second report concluded that based on management's progress against the actions, three are now considered low risk and two remain at medium risk. The medium risk findings relate to finding number three and finding number five listed in Table 5.4 above.

5.113 For actions 'not implemented' or 'partially implemented' revised target dates have been set, new actions identified, or it has been concluded that the action is no longer required as the risk has been mitigated or is to be accepted by management. The GIAA has now confirmed that the remaining actions were closed.

5.114 In addition, in April 2019, the Department and IPA published a joint report "Lessons from transport for the sponsorship of major projects" which included 24 lessons. Subsequently the Department has undertaken a pilot study to develop a toolkit to assess projects against the lessons from the major projects report. It provides an assessment table to evaluate projects against the lessons and provide a baseline maturity with actions. The Department and HS2 Ltd undertook this exercise in August 2019 and shared the results with the Chairman of HS2 Ltd and the Department's Permanent Secretary

5.115 The Oakervee Review opined on the Government's capability in sponsoring the project. It considered that the Government could increase its own engineering, construction and project management capability which would have the potential to improve its grip on cost. He also concluded that the Department needs to exercise stronger control of scope through the change control process, whereby additional scope is only added when funding is available to do so. This aligns with the findings of the GIAA capability assessment which the Department is taking forward.

HS2 Ltd Capability

5.116 Since early 2018, HS2 Ltd has undertaken a programme of work to ensure it has sufficient capability ahead of NtP. Working with Deloitte it developed an Enterprise Capability Framework comprising a bespoke Capability Model and Five-Point Maturity Scale. Against this scale, the minimum target maturity for NtP was previously agreed by the HS2 Ltd Board as Level 3 (L3) 'implemented'.

5.117 To provide the Department with the robust assurance required for NtP, an Enterprise Capability Assessment process has been undertaken to understand HS2 Ltd's capability against the maturity levels deemed by the HS2 Executive Leadership Team (ELT) to be necessary for Phase One. Given the scale and breadth of the HS2 programme, combined with the complexity of HS2 Ltd's role as systems integrator, no existing industry frameworks would sufficiently define and measure HS2 Ltd's capability for NtP. As such, HS2 Ltd worked with Deloitte to create a suite of bespoke methodologies and frameworks to evidence readiness.

5.118 HS2 Ltd conducted a baseline assessment of enterprise capability maturity in April 2018 which led to the mobilisation of the HS2 Improvement Programme (HIP) to deliver the required improvements in capability to achieve target maturity. This work has identified 24 capability areas that HS2 Ltd would need to become expert in to successfully deliver Phase One.

The HS2 Improvement Programme (HIP)

5.119 The HS2 Improvement Programme (HIP) was established to address the gaps in HS2 Ltd's Capability in readiness for NtP. The objective of HIP was to provide assurance to the HS2 Ltd Board and the Department that HS2 Ltd will have sufficient capability to proceed to main civils construction.

5.120 The critical task of demonstrating readiness on a programme of such scale and complexity is unprecedented. HS2 Ltd partnered with Deloitte to demonstrate HS2 Ltd's capability and readiness, using an approach which is informed by leading industry practice and experience of other major global infrastructure projects.

5.121 The HIP approach followed is summarised below:

- Design of a bespoke Enterprise Capability Framework and assessment methodology for HS2;

- Assessment of enterprise capability in April 2018 and mobilisation of the HIP to deliver any required capability improvements in time for NtP;
- Re-assessment of enterprise capability in June 2019, and;
- Assurance of HIP and HS2's readiness, using three Lines of Defence.

5.122 The Enterprise Capability Assessment (both the methodology and the outcomes of the Assessment) were subject to assurance by three Lines of Defence. LoD1, the HS2 Improvement Programme Steering Group, is chaired by the Chief Executive and attended by a subset of the Executive Leadership Team. LoD2 is provided by HS2 Internal Audit, with support from GIAA, and formal oversight by HS2's Audit and Risk Assurance Committee. LoD3 was commissioned by the HS2 Board and comprised a panel of industry experts, chaired by the President of the Institution of Civil Engineers

5.123 The re-assessment of enterprise capability in February 2020 demonstrated that significant improvements across all 24 capabilities have been observed since the Baseline Assessment in April 2018, with all areas achieving a minimum of Level 3 (L3) by NtP. A strategy, with associates plans, to build key target areas of capability to Level 4 (enhanced maturity) during the period up to 2020 has also been developed and endorsed.

Revised operating model

5.124 In addition to HIP, HS2 Ltd has reviewed its ways of working to improve collaboration and address cost and schedule pressures, under the banner of Project Evolve. The project was tasked with further strengthening readiness for NtP by ensuring that HS2 Ltd has an appropriate delivery model and structure in Phase One.

5.125 The revised structure marks the beginning of a shift towards a more asset and contract-based approach, with IPTs which will see HS2 Ltd and delivery partners co-located to drive delivery and collaboration. This will give far more flexibility and efficiency to delivery, empowering delivery teams to make decisions and deliver outcomes while reducing bureaucracy and duplication across the MWCC joint ventures and HS2 Ltd.

5.126 The IPT is a single, co-located organisation that identifies itself as a unified and bounded entity with one leader. It is a devolved client model, not an alliance, which means that accountabilities between client and contractor are clear. All parties are required to collaborate and work together in teams to achieve aligned objectives. Where possible, processes are streamlined to align governance and assurance, supported by an integrated approach to reporting. Interface and engagement within geographical boundaries is coordinated from within the IPT so that the HS2 project is consistently represented, and decisions are taken at the lowest level of governance based on the appropriate remit and delegated authority.

5.127 A Construction Director has been appointed to take overall accountability for the new Construction Directorate and its work, reporting directly to the Chief

Executive. This role is focused on delivering contracted work packages in Phase One. This is a major step forward, giving clear leadership to the new directorate.

5.128 The Infrastructure Directorate continues to hold accountability for system integration in HS2 Ltd, owning technical integration in design and assuring integration through delivery. Construction Directorate owns delivery of the integrated infrastructure system, including integration of works within and across contracts to deliver to time, budget and quality.

5.129 HS2 Ltd's Independent Assurance Panel on enterprise capability has not provided assurance of the impacts of Project Evolve on HS2 Ltd's capability to manage and deliver the programme. Considering the importance of Project Evolve and IPTs, DfT has requested that HS2 Ltd provide a monthly update on these issues for the next six months.

Board capability and effectiveness

5.130 A key objective for the Chairman of the Board on his appointment in December 2018 was to improve the capability, skills and capacity of the Board as the project moves into construction. In April 2019 two new NEDs were appointed to fill this gap with expertise in regeneration and organisational design. A new campaign is underway to appoint further NEDs, specifically targeting expertise in rail and major infrastructure. Alongside this, two new Directors will attend on behalf of the Department and HM Treasury.

5.131 In line with the corporate governance code of practice, HS2 Ltd commissions an independent review of its board effectiveness every three years. The most recent effectiveness review was concluded in September 2019 and its recommendations will now be taken forward by the Chairman.

Staff capability: Skilled for Success

5.132 The HR function within HS2 Ltd leads the developing and delivery of 'Skilled for Success', the HS2 People Strategy. Most recently reviewed and approved by the HS2 Ltd Board in July 2019, Skilled for Success sets out four key priority areas linking HS2 Ltd's seven strategic goals:

- An effective client organisation, with the right capabilities
- Realise the HS2 skills legacy
- Develop a talented, diverse workforce and an inclusive culture
- Proactive, innovative and professional HR.

5.133 DfT has also recently taken receipt of a Project Assessment Review which closely examined HS2 Ltd's capability to manage and deliver the programme and made recommendations around strengthening and increasing the resilience of the Executive Team and ensuring clear accountabilities, processes and controls for IPTs. HS2 Ltd has been asked to set out its plans to act on these recommendations ahead of approval of NtP.

The Oakervee Review's conclusions on HS2 Ltd capability

5.134 The Oakervee Review examined evidence from different sources relating to whether HS2 Ltd is able to deliver the project effectively. He reviewed evidence and conducted interviews in relation to the HIP, concluding that “HS2 Ltd’s Board and corporate governance appear to be nearing substantial readiness for the next stage of the HS2 project”.

5.135 The Review made a series of recommendations to drive up capability to reflect how the programme’s lifecycle, which are set out below. Some of these recommendations are already being implemented although the Department and the Infrastructure and Projects Authority will monitor the implementation of others through regular assurance reviews:

- Additional Non-Executive Directors should be appointed;
- HS2 Ltd’s governance arrangements need to evolve and strengthen to reflect the project’s complexity and scale;
- Systems integration within HS2 Ltd needs strengthening, learning from Crossrail;
- HS2 Ltd should work closely with the Shadow Operator and NR to ensure its decisions reflect the operational perspectives of these organisations;
- HS2 Ltd needs to demonstrate improvements in cost estimation, management and control;
- HS2 Ltd needs to demonstrate improvements in stakeholder engagement.

Annex A: Regeneration of regional economies – West Midlands Case Study

- 1 The West Midlands has a strong and prosperous economy and in 2019 GVA in the West Midlands [reached £99bn](#). HS2 is already having a positive impact in the region – according to the [Deloitte Crane Survey](#), Birmingham has seen record levels of construction with both developer and investor confidence high as preparation for HS2 and the 2022 Commonwealth Games draws closer. In 2019 Birmingham saw 41 schemes under construction compared to 38 the previous year and 2019 was a record year for construction of office space.
- 2 According to a commercial pipeline development study commissioned by HS2 Ltd the estimated gross development value within 1km of Curzon Street station is £7.6bn, more than the original growth expectations in 2015.
- 3 Once HS2 is operational, Birmingham represents an opportunity to increase the West Midlands' economic performance further. Reduced journey times will improve connectivity between Birmingham and other major cities in the UK. This is already influencing where businesses and households decide to base themselves, which has the potential to bring significant numbers of new jobs and visitors to the city. HS2 will also release capacity on existing rail lines into Birmingham, further supporting Birmingham City Centre's growth.
- 4 Phase 2a and 2b will further strengthen Birmingham's role at the centre of the UK's rail network providing direct connections to the key regional centres of the North.

Birmingham City Centre Enterprise Zone

- 5 A completely new terminus station will be built at Curzon Street, the first to be built in the City in over 100 years. The area around the station is set to become one of the best connected and productive business locations in the country.

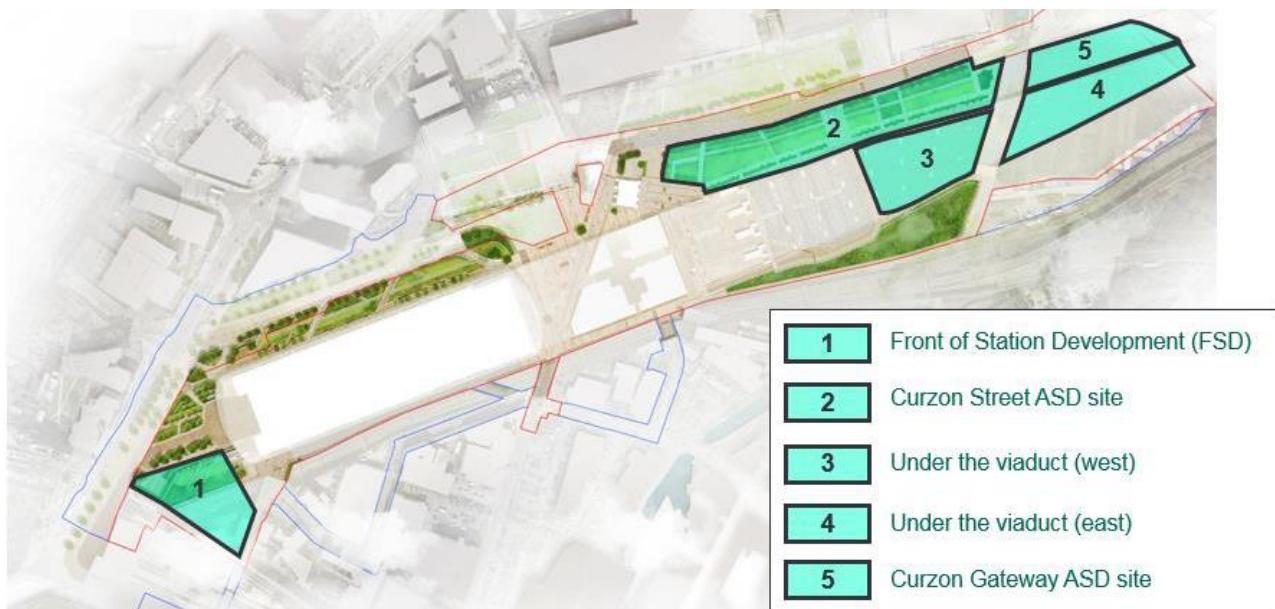
Figure A1: Birmingham Curzon Masterplan



Source: Birmingham Big City Plan

- 6 The positive impact of HS2 can already be seen in Birmingham. Birmingham City Council (BCC) is integrating HS2 into its local plans for economic regeneration, such as the Enterprise Zone (EZ), which is a 113ha area across 39 sites created in 2011, to maximise early opportunities from HS2. HS2 Ltd is working with BCC to accommodate scope enhancements to facilitate and support [the Big City Masterplan](#).
- 7 HS2 Ltd is working with local stakeholders to develop commercial opportunities to make a positive statement alongside the HS2 station.
 - Around £60m has already been allocated to fund development work to maximise these early opportunities
 - A further £20m of funding has been allocated from 2028 onwards for the development of the site around the HS2 Interchange station.
 - In 2019 BCC made £165.4 million of investment in the regeneration and development work of the Paradise development in the City Centre, Metro Extension from New Street to Centenary Square, and the redevelopment of Centenary Square.

Figure A2: Five commercial development sites at Curzon Street Station



- 8 The EZ is developing a Business and Skills Strategy to attract investor occupiers, grow existing businesses, accelerate scale up of high growing start-ups and establish high growth start-ups. The Business and Skills Strategy will focus on business, professional and financial services, financial technology and creative and digital industries. BCC says that growing these sectors will maximise growth in jobs, skills and the wider Birmingham economy.
- 9 Transport for the West Midlands proposed expansion of the Midland Metro Tram Network has the potential to further enhance the opportunities for new development and job creation. The Department confirmed in 2015 that it would provide £131.7m funding towards the Birmingham East Side Extension of the tram. As part of the plans for connectivity and development around the new HS2 station Curzon metro stop will be integrated with the HS2 station.
- 10 HS2 Ltd's decision to base its headquarters in Birmingham has created 1,500 jobs in the region. Birmingham also co-hosts the National College for High Speed Rail and includes offices from Highways England and Network Rail. The construction sector and transport planning supply chain is already concentrating in the Midlands.
- 11 HS2 and the subsequent Curzon Street Masterplan proposals from BCC will bring a range of temporary and permanent jobs to the city. Around 1,000 jobs are expected to be created in the construction phase, 200 jobs in the operational phase, and 36,000 jobs are expected to be created within the Masterplan area. A large percentage of these jobs will be in high order occupations; 61 per cent of jobs will be either managers, professionals or associate professionals., 17 per cent admin/secretarial and 12 per cent sales and customer services.
- 12 The growth benefits will be felt beyond the initial investment in regeneration and development. Investment in the EZ will generate £2.1 billion net additional GVA for the region. New office space will result in creation of business rates, which can be

reinvested in infrastructure in the EZ and beyond.

- 13 The creation of 9,500 residential units will result in important economic benefits, including improved labour mobility and supply, increased productivity and additional expenditure in the local economy.

Birmingham Interchange and Solihull

- 14 The HS2 Interchange station is a new station opening up opportunities for regeneration in the Solihull area. HS2 interchange will be 38 minutes from London and offer links to Birmingham Airport both from Central London and Birmingham city centre. This will generate opportunities for international connectivity and related growth particularly in East Birmingham and Solihull.
- 15 The expansion of Birmingham Airport is forecast to create approximately 10,000 full-time jobs and potentially substantially more associated with both the direct operation of the Airport alongside retail and other service activities within the terminal.
- 16 The area surrounding the proposed station represents a significant opportunity for development.

Figure A2: UK Central Hub Vision 2029



Source: Urban Growth Company

- 17 Interchange station will be built on currently greenfield site in Solihull. Supported by Solihull Metropolitan Borough Council and West Midlands Combined Authority, the Urban Growth Company (UGC) was created to lead on development of the site around the station and realise the economic potential of the HS2 Interchange station with the

development of the UK Central Hub, an area around the proposed Interchange station, which is home to Jaguar Land Rover, Birmingham Airport, the National Exhibition Centre and Birmingham Business Park.

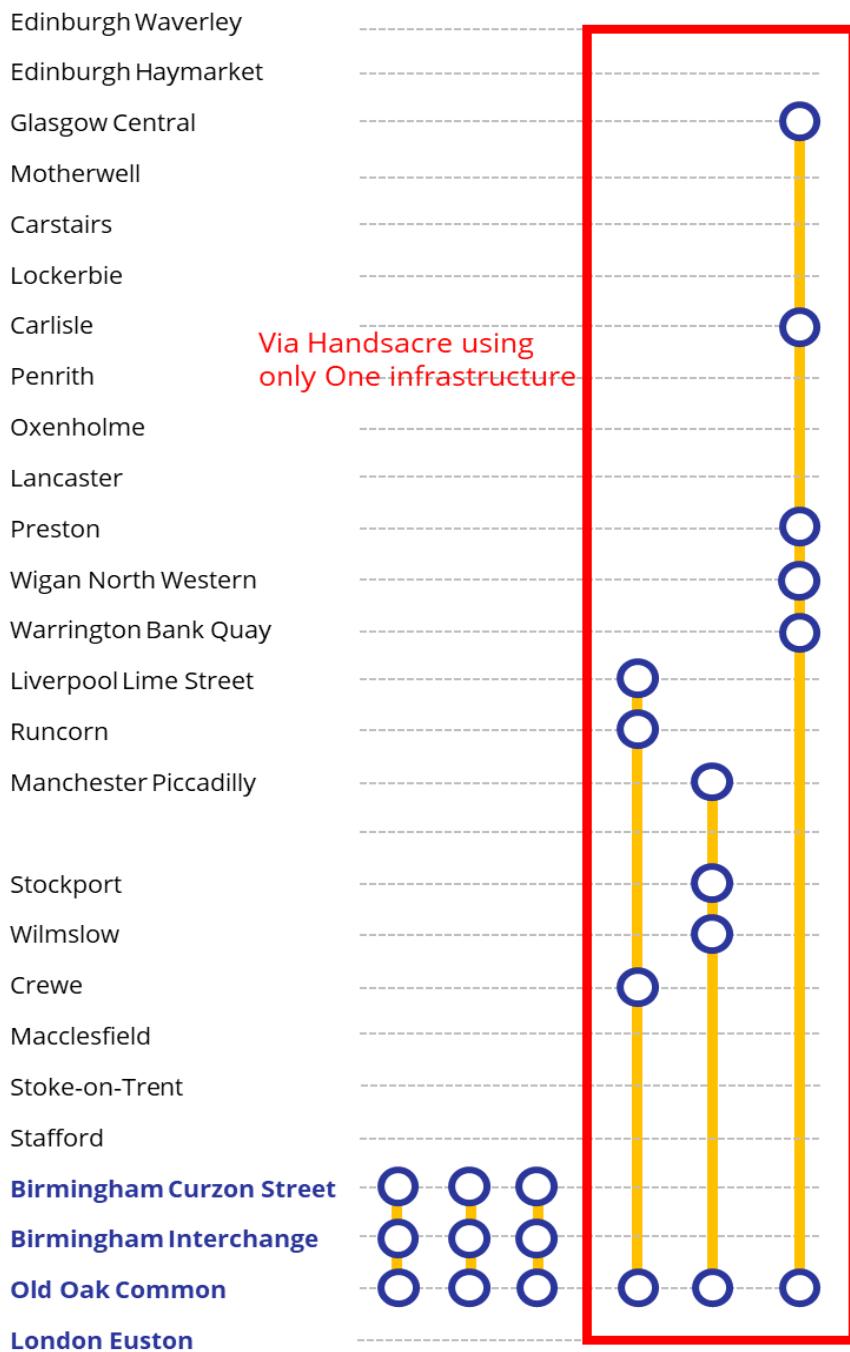
- 18 The UGC has an aspiration that the UK Central Hub can provide:
 - 35,000-77,500 jobs
 - 22,750-person years of construction employment
 - 775,000m² of new commercial and mixed-use floor space
 - 3,000-4,000 new homes
 - £2.1-£4.1bn in GVA
- 19 The arrival of the HS2 Interchange station and investment in the surrounding area will provide a boost to manufacturing and industrial development in the region. One of Jaguar Land Rover's three UK manufacturing plants is in Solihull. It is one of the biggest local employers in the region, employing approximately 10,500 staff. The potential investment and growth opportunities in the UK Central Hub would enable Jaguar Land Rover to boost its manufacturing capabilities in the region. According to a 2018 report from the Urban Growth Company Jaguar Land Rover is exploring the costs and benefits of a freight rail link at Solihull to support both site and global operations. Jaguar Land Rover's expansion would result in significant demand for new goods and services from its supply chain. Jaguar Land Rover is also a significant user of freight capacity on the WCML and will benefit from additional freight paths released by Phase one.
- 20 There is expected to be an increase in demand for a range of skills and the new jobs that will be created within the Hub area and through the supply chains will result in a substantial range of training and apprenticeship opportunities.
- 21 Construction work at the Hub will take place over a 25 year plus period, sustaining construction sector activity over the long term. HS2 Ltd are working closely with the UGC to optimise the opportunities for development.
- 22 UGC are also working with Highways England, Network Rail, developers and other agencies to ensure that the local benefits are maximised. In terms of the construction and engineering works, the UGC estimates that over 3,500 new apprenticeships will be created. These will be generated over a period of more than 25 years, resulting in a sustained pipeline of apprentice opportunities.

Annex B: Modelled Train Service Specification

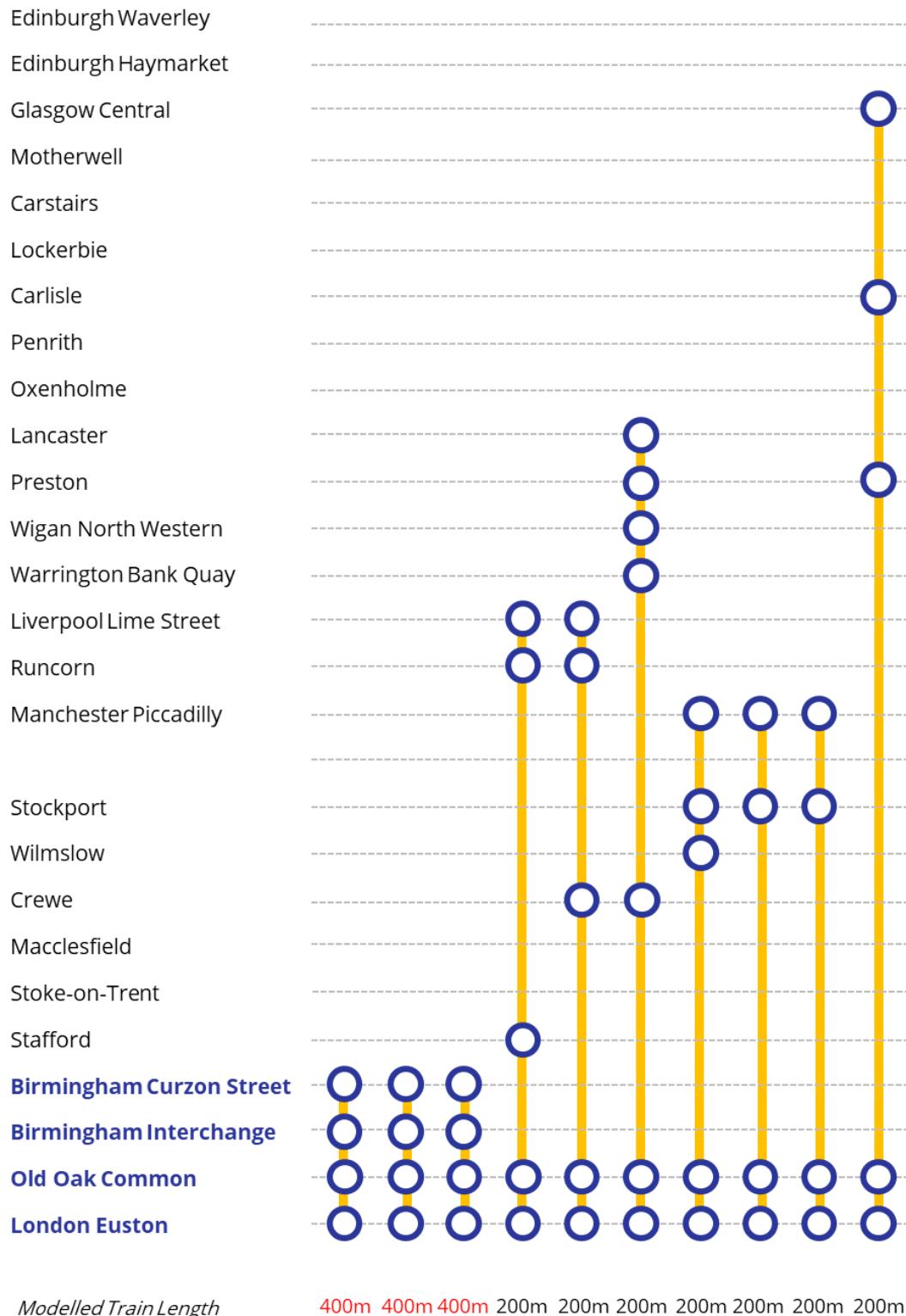
"Parliamentary Powers" Opening Strategy TSS between 2029 and 2031⁶

- 23 The phased opening assumed 6 trains per hour (tph) from Old Oak Common between 2029 and 2031. The TSS provides the following services to/from Old Oak Common making use of Phase One networks:
- 3tph Old Oak Common – Birmingham Curzon Street
 - 1tph Old Oak Common – Liverpool Street via Crewe and Runcorn (via Handsacre)
 - 1tph Old Oak Common – Manchester Piccadilly via Wilmslow and Stockport (via Handsacre)
 - 1tph Old Oak Common – Glasgow Central via Warrington, Wigan, Preston and Carlisle (via Handsacre)

24 “Parliamentary Powers” Opening Strategy TSS between 2029 and 2031⁷

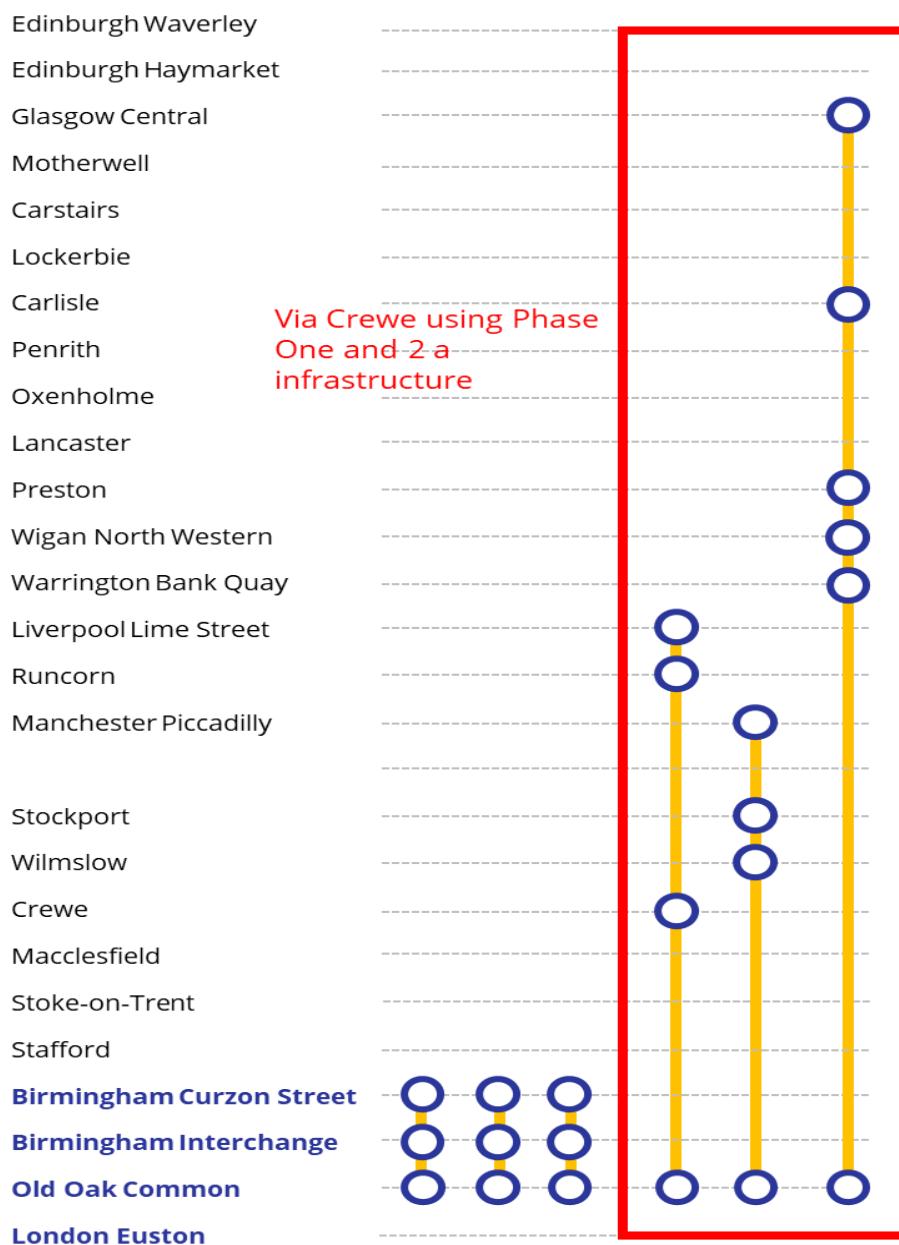


"Parliamentary Powers" TSS once fully operational

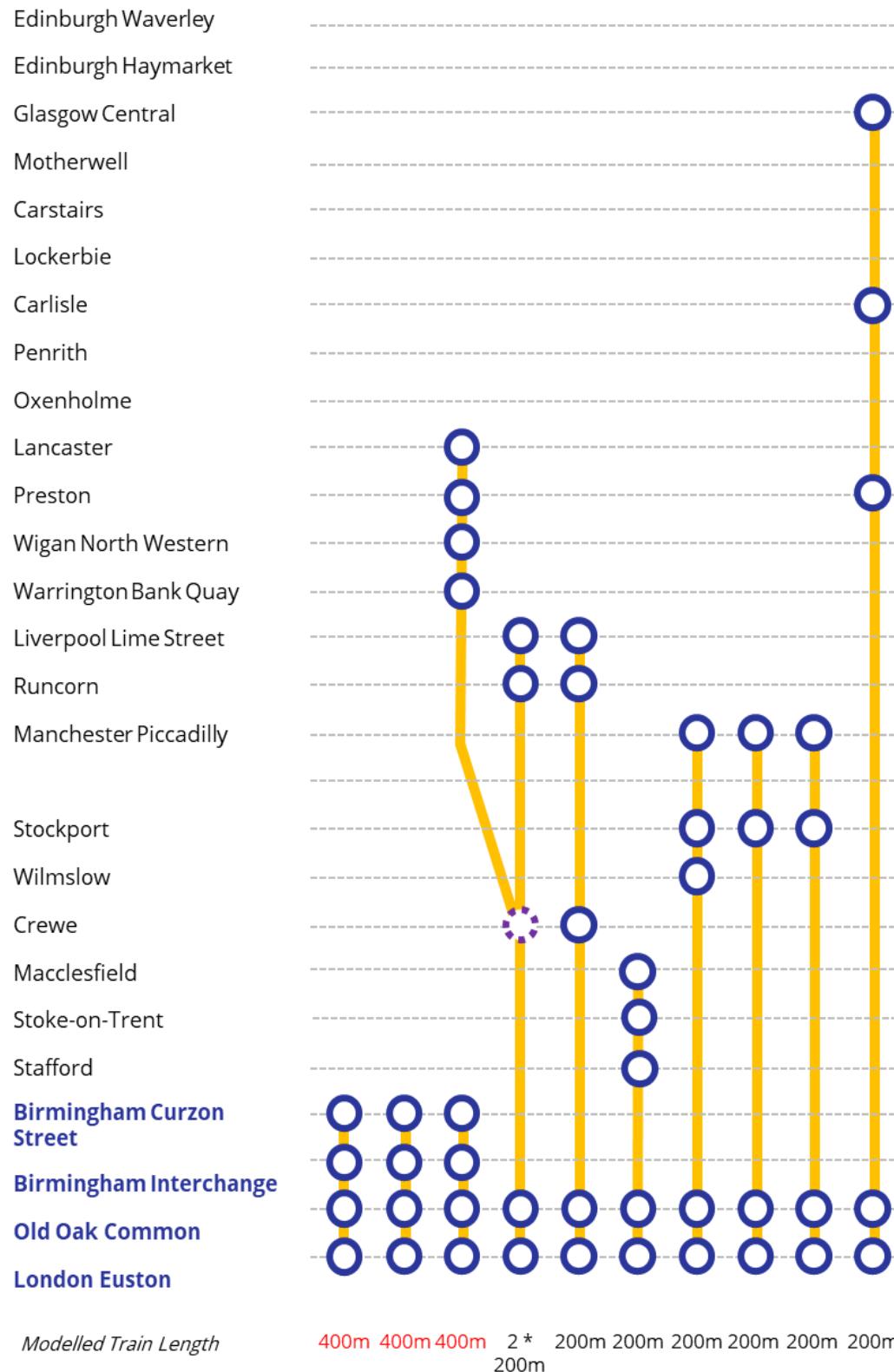


"Statement of Intent" Opening Strategy TSS between 2029 and 2031⁸.

- The phased opening assumed 6 trains per hour (tph) from Old Oak Common between 2029 and 2031. The TSS provides the following services to/from Old Oak Common making use of Phase One and 2a networks:
- 3tph Old Oak Common – Birmingham Curzon Street
- 1tph Old Oak Common – Liverpool Street via Crewe and Runcorn (via Phase 2a infrastructure)
- 1tph Old Oak Common – Manchester Piccadilly via Wilmslow and Stockport (via Phase 2a infrastructure)
- 1tph Old Oak Common – Glasgow Central via Warrington, Wigan, Preston and Carlisle (via Phase 2a infrastructure)

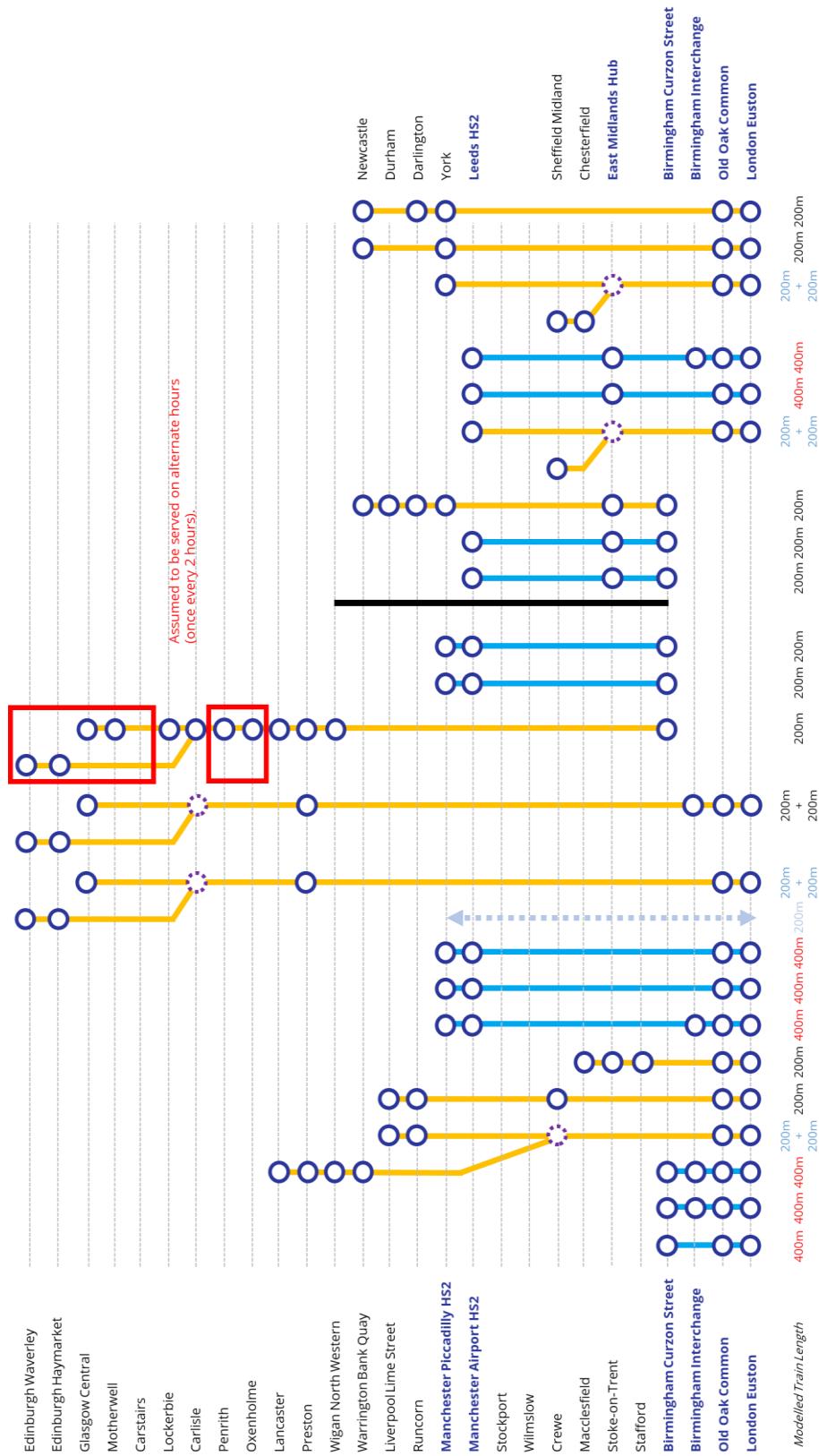


"Statement of Intent" TSS once fully operational



“Full Y Network” TSS once fully operational

- The opening strategy for the “Full Y Network” scenario is the same as for the “Statement of Intent” case. The full network opens in 2035 with 17tph from London Euston.



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- ¹ All prices in the Full Business Case are presented in Q3 2019 prices, unless otherwise stated.
- ² 2010/11 is the original base year used for growth forecasts in the 2013 HS2 Phase One Business Case and 2015 HS2 Phase One Business Case supplement.
- ³ Passenger Demand Forecasting Handbook
- ⁴ TAG Unit A3 Environmental Impact Appraisal
- ⁵ Basis of estimate: a) Phase One Baseline 7.1 b) VAT, escalation, OSD, O&M, sponsor costs and funding/financing costs all excluded. c) Contingency excluded (P50 risk would add c.27% to all the figures)
- ⁶ Note that the TSS within the red square go via Handsacre for Parliamentary Powers infrastructure, via Crewe for Statement of Intent infrastructure.
- ⁷ Note that the TSS within the red square go via Handsacre for Parliamentary Powers infrastructure, via Crewe for Statement of Intent infrastructure.
- ⁸ Note that the TSS within the red square go via Handsacre for Parliamentary Powers infrastructure, via Crewe for Statement of Intent infrastructure.