

Connecting Britain by Rail

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A Prospectus for Change: Summary

1 This prospectus considers what improvements can be made in train services and the existing railway network if HS2 is not built, giving transport and economic benefits to all the regions, cities and towns north of London which HS2 would have approached.

2 It explains why achieving these changes requires integrated management of the railway, its capacity, its spending on infrastructure, and the train services which run on it – though not necessarily integrated ownership.

3 It has been produced *pro bono* by a small group of experienced railway business and operations managers. It is not a detailed investment plan, but it gives many examples of the kind of improvements which can be made, and of the benefits of them.

4 Details of specific proposals are not included, but they could be provided if needed. In particular, for the West Coast Main Line, the route which HS2 has sought most strongly to supplement, a much more detailed proposal prepared last year could readily be circulated as an indicator of the kind of alternatives which could be applied on other routes too.

5 Implementing a programme of improvements which are not interdependent but are complementary would avoid the long lead time for a return on the single investment in HS2, and, by spreading risk, would reduce it very substantially.

6 Improvements are available in the short term by changing the way in which the capacity of the network and of train services on it are managed, which will we hope be enabled by the Williams review.

7 For the medium term, and, on a larger scale, in the longer term, the prospectus recommends numerous specific projects to improve the railway infrastructure, its capacity and its reliability. They include:

Increasing scarce city centre terminal capacity by using space no longer needed for HS2. Adding tracks and introducing grade separation to segregate trains and increase capacity at critical locations and restrictions; and meeting the needs of freight customers too.

Developing city-region networks, including routes across the Pennines, to exploit railways' ability to carry high volumes of passengers and freight quickly.

Incrementally, constructing discrete stretches of new track where they will have a particularly beneficial effect in increasing capacity, reducing journey times, improving reliability and meeting future growth in demand.

Initiating a 20-year programme of network electrification, improving train services in the whole zone of Britain northwards from London, and contributing to the achievement of climate change policy objectives.

8 The investment proposals would involve a wide range of engineering and construction skills at sites spread from Scotland, northern England and the Midlands to south-east England.

9 This is the theme of the whole prospectus: benefits greater than those offered by HS2 can be obtained incrementally at better value and lower risk, and spread much more widely between the regions and citizens of the nation.

10 The paper is necessarily concise. Its authors will of course answer questions about what they propose, and amplify any details that will help decisions about the options.

The Authors

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Those who have made this proposal have no connection with any company active either in today's railway or on HS2, and they are not receiving any payment for producing it. They do have a lifetime of experience in various sectors of the rail industry.

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A Prospectus for Change

I. Introduction:

I.1 The review of the case for the High Speed 2 railway creates both the need and the opportunity to consider other ways in which the railway network can contribute to meeting the future economic, social and environmental needs of the nation.

I.2 Many now appreciate that HS2 would be an expensive way of meeting only some of these needs, mainly for travel to and from London. It is increasingly understood that improving the connections within and between other cities and regions of the country could help achieve a wider range of policy objectives and give a higher return on investment.

I.3 To inform decisions about the options, a small group of experienced railway business and operations managers has prepared these proposals.

I.4 We propose changes which can be made over the next ten years, enabling improvements in train services which will be welcomed publicly and politically, facilitate economic growth, meet societal goals and be environmentally sustainable.

I.5 We outline the kind of changes that will be needed in the railway's management, trains, systems and infrastructure to enable these improvements. We propose a broad programme, from which projects can be advanced as the case for them is confirmed. Over time, the programme will doubtless evolve as priorities and opportunities develop. Managing it will require a change in the approach to developing and assessing strategic infrastructure improvements – in particular, to reduce the timescale and overhead cost of a process which has become stifled by analysis.

I.6 Planning and implementing the programme will require the expertise of many people in a wide range of disciplines, from railway operating to project planning to construction and systems integration. It will need Network Rail to continue to rebuild its own capability in operations management, and to equip itself to lead other disciplines towards objectives set from outside, not within, a project. It will not be starting from scratch, but in part reorienting the capabilities of the contractors and workforces now engaged on HS2.

I.7 Some of the improvements can be achieved in the short term without significant investment; some will be achievable in the medium term with infrastructure change largely within the existing railway boundary; other parts of the programme will need more preparation and consents and a longer term. While many of the proposals are self-contained, and benefits will accrue from each as it is implemented, most complement each other: their whole exceeds the sum of their parts.

I.8 Importantly, the benefits will begin to flow as each proposal is implemented, rather than very high expenditure being followed by a long lead time before any return is earned from a very large project. The proposals do not have counter-productive interdependencies: while improvements in the railway network are by definition connected, those that we propose each give specific benefits of their own, with synergy between them as more are completed.

I.9 Our proposals also reduce long term risk, by adapting the existing mixed-use railway, rather than building a separate new line to technical standards which only match the needs of very high speed, long distance passenger trains.

1.10 In this paper, we set out our proposals in broad terms, giving examples to illustrate the scope, benefit and timescale of each kind of improvement. Our emphasis is on the output of each of the proposals: improving the services that passengers and freight transporters actually need and railways can meet well, and which therefore have an economic basis, is essential if the programme is to be developed and implemented. Of course, eventual decisions will also depend in part on political considerations. While we provide at this stage no project or financial details, we are confident that all our proposals are feasible in railway business, operating and engineering terms, and are worth taking to a next stage of appraisal.

2 Precondition and Scope

2.1 The proposals have as a pre-condition change in the strategic management of the network and how trains use it. They require the system operator, a body with overall responsibility for the railway, to integrate the planning of infrastructure improvements, the allocation of capacity, the technical and performance standards of trains operating on the network, and the priorities of national and regional decision-takers and funders.

2.2 We assume that the Williams review will recommend a ‘concession’ model which meets this precondition. Whatever the framework by which the operation of train services is delegated to operators of concessions or franchises, open access passenger and freight

operators, and to local control, the network’s capacity must be planned and allocated in an integrated process which optimises effectiveness and efficiency.

2.3 While the programme of electrification, the generic improvements in quality, and adapting the process for the management of capacity must have a wider geographical scope, our proposals for train service improvements are focussed on the broad swathe of the country between Scotland, northern, midland and south-eastern England which the existing north-south trunk routes serve and which HS2 would have approached.

2.4 Proposals in regions outside those served by or connected to the East Coast, Midland, Chiltern and West Coast Main Lines, and the conurbations and regions that they serve, are not included at this stage. We hope that discussion of the proposals described here will change the attitude to investment in train services and the network in parts of England and Wales served by other main lines and regional networks eastwards, southwards and westwards from London, and advance the preparation of similar prospectuses for the country’s other regions.

3 Principles:

3.1 Short term: Train Services

3.1.1 Our simplest and quickest proposals are for changes in train services, the railway timetable, which can be made without infrastructure investment and will, by using existing capacity better, make more seats available; and for operational planning changes, made by train operators as well as by the infrastructure controller, to improve reliability and facilitate quicker recovery when things go wrong.

3.1.2 Lengthening trains within the same timetable is the most efficient means of increasing capacity. It just requires more trains, though some may need modification to operate on different routes. It will be possible to put back into service quickly – on electrified routes – the surplus of electric multiple unit trains released by new franchisees who have replaced

them prematurely. It may be necessary in some cases to increase maintenance depot capacity, and to extend platform lengths. In many locations this can be done at relatively low cost, but at some signalling alterations may be necessary, and the timescale will be longer and the cost higher.

3.1.3 We note that not building HS2 will automatically improve the train services at the cities that it would have by-passed compared with their reduced future services. Filling capacity on the older routes with trains serving shorter distances by making more frequent stops, and not carrying many of the longer-distance passengers, would have worsened the service between London and Coventry, Wolverhampton, Stoke-on-Trent, Leicester, and Doncaster, and several other places. Continuing and improving the existing Inter-City services to Birmingham, Manchester, Nottingham, Sheffield and Leeds will be to the advantage of these main intermediate points.

3.2 Short term: Infrastructure

The reinforced impetus and direction already given through a clearer managerial focus to Network Rail's maintenance and renewal programmes will give other short-term gains in reliability. There is scope to use this programme also to make minor enhancements to the infrastructure, improving in many small ways its capacity, capability, maintainability, and reliability. There are numerous places where tactical changes in operating procedures and signalling equipment can simplify train operation, smooth the flow of trains and improve punctuality.

3.3 Medium term: Train Services and Infrastructure:

3.3.1 In the medium term, we propose schemes to improve the infrastructure at key points on the existing network, its capacity, its capability and reliability. Applying better working methods, these schemes can be completed more rapidly, less disruptively and more cheaply than has become the norm over the past two decades. They can enable significantly better train services on individual routes and on local networks. This can mean easier daily journeys to work, to college, shop, to sport and entertainment, and to visit friends whether in the same city or another county. The wider benefits, especially in deprived areas, of better access to education and employment will be especially valuable.

3.3.2 Again, these changes require planning and management as a co-ordinated whole, considering the network's strengths and weaknesses, what it can do well, how to avoid conflicting priorities, and how to improve services regardless of the divisions of responsibility between today's operators. This approach offers the opportunity, while replanning the timetables of significant parts of the network, to improve and exploit connections between train services, giving many more passengers more convenient itineraries between a wider range of origins and destinations.

3.4 Longer term: Infrastructure and Train Services

3.4.1 In the medium to long term, more substantial improvements can be made in the capacity and capability both of the regional networks and of the existing trunk routes northwards from London. The latter can be achieved in incremental steps, and give benefits both to the areas in South-Eastern England where capacity is now most heavily used and the regions further North.

3.4.2 Improving the network in this way would not require the entire capital expenditure before any return at all is earned, and would not limit its benefits to routes to/from London, but would also meet regional needs.

3.4.3 Such improvements to the railway network need to match the country's economic geography and its social and political development. A comparison is often made between Britain and France, which has constructed dedicated high-speed lines radiating from Paris to provincial cities spread towards and around the coasts. Many observers consider that, rather than spreading economic growth and political power to the provinces, their effect is to maintain the over-dominant position of Paris in France's economy and society.

3.4.4 The better example for Britain in the future is Germany, whose major cities are spread throughout the country. There, investment, especially since reunification in 1990, has been applied to connecting the conurbations by a grid of high-quality routes. Some stretches, especially through hilly regions, have been newly-built, others follow older routes but upgrade their capability. All serve the stations at city centres which are the hubs of regional networks: so the cities and towns of each of Germany's provinces benefit from connection with every other part of the country.

3.4.5 Strengthening the network, and several of the routes which form it, has other advantages for resilience and risk. In the event of disruption, to facilitate maintenance, and to match the evolution of markets, a more capable network, rather than single-purpose routes, is more flexible. Being able to use the same trains on different routes, whether because all are electrified or all use the same signalling technology, is important in enabling alternative routings through the network and assuring uninterrupted service.

3.4.6 Our proposals take account of the strengths and weaknesses of railway technology as a way of meeting transport demand. Railways are very good for carrying people long distances fast, for carrying people in large numbers where demand is high, and for carrying freight in high volumes while minimising environmental intrusion. They are not good at serving disparate, low volume flows of either people or freight. HGVs and cars have a dominant share in the transport market because of their flexibility in meeting a very wide

range of diverse demands. For shorter distance urban journeys, trams and buses serve users' requirements for accessibility and frequency better than do trains on routes shared with conflicting demands for speed and volume. Our proposals are directed to improving railway services where they can meet people's needs well.

3.5 We therefore propose:

3.5.1 Substantial investment to increase city centre terminal capacity, some of it using the space in London and Birmingham cleared by the HS2 enabling works;

3.5.2 Adding two new tracks to some double-track sections of existing routes, more than doubling their capacity by enabling trains to be segregated by speed.

3.5.3 Segregating the use of some heavily used route sections between Inter-City and regional and local services, again more than doubling capacity, and enabling significant improvements in services meeting the needs of both markets;

3.5.4 Constructing relatively short new stretches of route, making new links in the network to strengthen its capacity, capability and reliability and to provide better alternative routes for maintenance and contingencies.

3.5.5 A programme to extend electrification to most of the network, essential for the achievement of climate change objectives as well as to improve train services.

3.5.6 The proposals are outlined in broad terms. They range widely in scale. We do not attempt at this stage to specify schemes in detail, nor to evaluate other than by orders of magnitude their environmental, societal and wider economic benefits. All, we believe, justify the next stage of assessment.

4 Proposals

4.1 Replacing the useful outputs of HS2: terminal capacity

4.1.1 HS2 would have made some improvements of undoubted value in train services and in the capacity of the infrastructure which supports them. Less beneficial parts of it worsened its overall case.

4.1.2 It would have given big reductions in journey times between its own stations, but some of them would have been badly located for where people actually wanted to be. The distance between Curzon Street in Birmingham and most of the regional services at New Street, or the location of Toton, remote from both Nottingham and Derby, would substantially reduce the origin-to-destination time saving. It would have allowed a more intense train service on the West Coast Main Line between London and Milton Keynes, but there is no need to build a new route to Birmingham, Manchester and Leeds to do that.

4.1.3 Enhancements to the existing network can both achieve some of these gains and use parts of HS2's enabling works to enhance the existing network.

4.1.4 City centre terminal capacity is scarce and valuable. The plans and preparations made by HS2 Ltd can be used to enlarge existing stations and improve their connections with regional networks. There is room for these enhancements at:

London Euston: additional platforms to the west of the station, constructed on land cleared for HS2, can be accessed by less ambitious changes to the approach lines, with improved interchange with the Underground and development above the platforms still feasible. This would increase capacity not just for services on the existing route, but potentially by other routes that could be connected to the station.

Birmingham Curzon Street: potentially the hub of both the Inter-City network, to north-west, north-east, south-east and south-west, and of the West Midlands regional network, with same station interchange between the two, making more capacity at New Street for regional services.

Manchester Piccadilly: new through platforms duplicating platforms 13/14 towards Oxford Road. On the other side, where space has been allotted for the HS2 terminal, either additional terminal platforms or lower-level platforms giving access to a cross-city tunnel towards the regional network north of the city; and widening and grade separating the approach tracks from the south and east.

Leeds City: construction of new terminal platforms on the site of a car park, and grade-separated approach tracks over vacant land on the north side of the station would reduce conflicts between train movements and increase capacity; and making two tracks four to its east would, by segregating fast and slow trains, increase its capacity and enable better train services.

Bradford: while HS2 did not plan to reach Bradford, there have long been proposals to connect the two stations north and south of the city centre, enabling a much better train service not just for the city but throughout the north-western part of West Yorkshire.

Glasgow Central: construction of new spans at the east side of the old bridge over the Clyde would increase the capacity of the station, relieve the present tight layout and reduce Inter-City journey times.

4.1.5 In Newcastle and Liverpool and at London St Pancras, not reached by HS2, **freeing** constraints on the size of the stations would be very disruptive of the surrounding city areas; we therefore propose other ways of improving services in the city-regions. In Hull, it would be easy to increase terminal capacity for enhanced services. And in Sunderland, while not a terminal station, reconstruction and expansion of the interchange with the Metro could create a much more suitable entrance to the city.

4.2 Replacing the useful outputs of HS2: capacity at the south ends of the West Coast, Chiltern, Midland, and East Coast Main Lines

4.2.1 The London ends of each of the northern main lines, where Inter-City, freight, and London commuting trains share constrained track capacity, each and together have potential to carry more trains.

4.2.2 West Coast sooner: Some of the opportunities do not involve infrastructure investment. The effective capacity of a route is determined by several variables and their interaction. On the West Coast Main Line, for example, significant capacity is consumed by stops in fast trains at Watford Junction, by trains crossing between fast and slow lines to give Leighton Buzzard unusually short journey times to and from London, by mixing 125mph tilt trains with 110mph trains, and by some Avanti and the London North Western trains being shorter than they could be. Changing the train fleets to standardise speeds and maximise seating, varying the intermediate stops, and improving the use of slow line capacity could together increase useable capacity – the number of seats on trains – by a third.

4.2.3 Chiltern: The route from west London towards the West Midlands could carry more and longer trains and free up capacity on the West Coast main Line for other destinations. But terminal capacity at Marylebone sets a ceiling which is already very tight on the capacity of the whole Chiltern route. Significant investment would be needed to lift this constraint. But if trains had access from Euston via Old Oak Common and Northolt to the Chiltern line, it would be possible to use the additional capacity at Euston as the terminal for West Midlands services by either route.

4.2.4 West Coast later: That opportunity is part of a greater potential to increase capacity towards Milton Keynes and Birmingham. Relatively short (compared with HS2) tunnel construction, given the existence of the lightly used Watford Local Line tunnels from Euston, could connect Euston with the Chiltern route via Old Oak Common – with no need for an interchange station there – and Ruislip. Making two tracks four from there to Seer Green, then a long and expensive tunnel (and a viaduct over the Hughenden Valley) to Princes Risborough could carry many more trains, a mix of Inter-City and commuter, to the far side of the highly-sensitive Chiltern countryside which has given rise to strong concern at HS2.

4.2.5 In a staged programme, which would also involve electrifying and accelerating the present Chiltern service, extending the four-tracking to Bicester, Banbury and beyond (not necessarily continuously) could exploit the very fast alignment of the existing route to carry the main London – West Midlands service. New construction running northwards

after the line crosses the Cotswold ridge could connect it to both Coventry and Attleborough, Nuneaton, on each part of the West Coast Main Line after it splits at Rugby. This incremental enhancement of the route would thus duplicate and relieve the constrained stretch of the West Coast Main Line, as well as improving the Chiltern route, and allow, in particular, more trains between London and Milton Keynes.

4.2.6 Midland: The reliability and capacity of the Midland Main Line could be increased by substantial investment near its London end. The imperfections of its integration with Thameslink and the limit on platform capacity at St Pancras could both be put right by constructing a flyover in the West Hampstead / Cricklewood area and changing how the four tracks are used north of there. Thameslink trains could cross between fast and slow lines in each direction without conflicting with trains in the other direction. This would increase capacity and reduce delays and allow Thameslink services to be extended to Corby. This would release scarce St Pancras platform capacity for trains to / from Leicester, Nottingham, Derby and Sheffield. The change could only efficiently be made when the signalling has to be renewed, whatever the future technology used.

4.2.7 East Coast: Making four-track the two-track section immediately north of Welwyn Garden City, across viaducts and through tunnels and Welwyn North station, has been studied for decades. It is the binding constraint on the capacity of the whole of the East Coast Main Line, makes reliability difficult to achieve, and has proved to be one of the base reasons for the problematic introduction of Thameslink services to and from Peterborough and Cambridge. A strategic decision to widen the railway could be quick; the resulting project would have to deal with very substantial environmental concerns and engineering tasks, and would take much longer. But there is no doubt as to the benefit for every user of the route, London commuters as well as Inter-City passengers.

4.2.8 The three-track section north of Huntingdon could have its fourth track replaced, separating southbound slower Thameslink, Great Northern and freight trains from faster Inter-City, and facilitating less disruptive maintenance.

4.3 Replacing the useful outputs of HS2: infrastructure schemes which improve the mixed-traffic capacity of key stretches of the network.

4.3.1 At Newark the East Coast Main Line crosses on the level freight and local passenger services on the route between Lincoln and Nottingham. Again, options for separating the flows have been considered for a long time, with substantial advantages for capacity, reliability and maintainability. Either grade separation at Newark itself or a new routing of the East Coast Main Line around it would achieve this in the longer term.

4.3.2 At Doncaster trunk East Coast Inter-City and freight services cross and mingle with each other and with flows to and from five other directions. While several of their conflicting movements are grade-separated, those closest to the station, mostly passenger services, are on the level. This limits the speed of potential non-stop services to and from Leeds, constrains the timetable and damages reliability. A scheme to separate many of the conflicting movements by construction of a flyover south of the station and new platforms to its west (at both, space could be available) would give capacity, reliability and maintainability improvements comparable to those gained at Rugby and Reading during the past 15 years. As there, the scale, cost and timescale would all be large, but the benefits correspondingly so.

4.3.3 At York, much smaller-scale changes in the track layout could improve capacity and flexibility at the north end of the station.

4.3.4 Between Newcastle and Edinburgh, the alignment of two sections of the East Coast Main Line limit speed and a third is at risk from coastal erosion. Substantial schemes to build more direct stretches of route to the east of Morpeth, between the Anglo-Scottish border and Reston, inland from the existing route, and south of Dunbar have been the subject of preliminary studies: their feasibility, in outline, has been established. Each would give a substantial increase in speed and together they would reduce the journey time to and from Edinburgh by about ten minutes, like all the East Coast improvements mitigating the absence of HS2.

4.3.5 On the West Coast Main Line north of Preston, where the interaction between freight and passenger services is a constraint on their timetabling and makes reliability more difficult to achieve, schemes could be carried out at several locations to raise capacity and performance. At Newton Junction, between Glasgow and Motherwell, a relatively modest change in the track layout could facilitate the double conflicting movement of local services across the path of Inter-City trains. Between Law Junction (Motherwell), Carlisle, Lancaster and Preston most of the loops which enable Inter-City to overtake slower freight trains, essential for the capacity available to both, are too short to fit the much longer freight trains which are now operated. Reducing the number of loops and replacing the most important by longer overtaking stretches of third and fourth tracks, would benefit freight operators by permitting more and even longer trains and passenger services by giving more flexibility in timetabling and better reliability.

4.3.6 The West Coast Main Line follows an indirect and speed-restricted route through Stafford. Capacity is constrained by conflicting movements of passenger and freight trains to and from different routes, especially on a short two-track section through Shugborough Tunnel. The feasibility of a by-pass route to the east, running from the four-track section east of Rugeley to the four-track section north of Norton Bridge, was established late in the programme of modernisation in the first decade of this century. Eventually, only the grade separation of the Crewe and Stoke routes at Norton Bridge was carried out. The by-pass scheme would give substantial benefits of capacity and reliability, and reduce journey times between London and Manchester, Liverpool, Preston and Glasgow by three minutes. It, like the similar by-pass projects on the East Coast Main Line, would thus directly mitigate the absence of HS2.

4.4 Network Electrification

4.4.1 We propose a programme starting at once and completed by 2040 to electrify most of the significant railway routes throughout England, and corresponding programmes, parts of which are already under way, for Scotland and Wales.

4.4.2 Disruption and costs can be minimised by exploiting the lessons of experience from the difficulties of the Western project, from successes in Scotland, and from the 2019 review carried out by the Railway Industry Association.

4.4.3 Electrification will facilitate many improvements in train services, can use quickly the current surplus of electric rolling stock, and will allow all future rolling stock investment to use electric traction – essential as it will still be in service after the 2050 zero carbon emissions target. It of course requires electricity generation continuing to be switched from fossil fuels to sustainable sources of electricity.

4.4.4 Train service improvements will encourage a shift to rail from other, less-sustainable modes, and especially from air, which will multiply this environmental benefit. If electrification covers a high proportion of the network it becomes operationally efficient for

freight train haulage, another environmental gain; and even quite small extensions of electrification can give disproportionate operational benefits.

4.4.5 Projects have been started but not finished mainly because their technical specifications, their costs, and their interfaces with other elements of the railway's technology lost touch with each other, with what could be afforded, and with the value of the benefits which could be gained. Strengthened by the certainty of a long-term committed programme, Network Rail and the supply industry can recover from these disappointments, apply the lessons of experience and of international methods, and, route-by-route, create a largely electrically powered railway. The practical advantages will be matched by the symbolic progress towards climate change goals.

4.4.6 Investment in bi-mode trains in recent years, necessary because of gaps in the electrified network and the absence of electrified diversionary routes, will facilitate the implementation of the programme and reduce its disruption of current services. Bi-mode trains can use non-electrified diversionary routes and maintain through services while the work is carried out. This in turn eases the task of installation, by making longer blockages available for it without unacceptable use of replacement coaches.

4.4.7 Once efficient methods have been established, the first stage is to resume the uncompleted projects from Didcot to Oxford, within Bristol, from Cardiff to Swansea, and from Oxenholme to Windermere. Next, they can be extended, from the presently planned end at Market Harborough to Leicester, Nottingham, Derby and Sheffield; from Newbury to Exeter; and from Swindon to Cheltenham. Filling relatively short gaps between long sections of electrified route would then allow bi-mode and eventually electric trains to replace the Cross-Country Voyager diesel trains on the York via Sheffield and Birmingham to Bristol, Reading and South Coast and the Nottingham to Cardiff Cross-Country services.

4.4.8 The trunk routes also carry regional and local services, and some of these could immediately be converted to electric traction. Others will require marginal extensions to the electrified network. While some of these will be more lightly used lines, the benefit of whole service groups and conurbation networks being electrified will give a strong case for the incremental investment. Conversely, electrification of regional networks will give, as a beneficial side effect, opportunities to operate inter-regional services over them with electric traction, and to use them as diversionary routes for maintenance periods or in case of disruption on the trunk routes.

4.4.9 The regional networks will thus provide better access both to their own centres and to Inter-City routes for longer-distance journeys, with end-to-end reductions in journey time balancing the absence of the HS2 sections of some of these itineraries. The regions in which electrification should be extended include:

Scotland: the local network connecting Fife with Edinburgh and the Transport for Scotland programme to electrify the routes connecting all of Scotland's seven cities.

North-Eastern England: especially the routes to Wearside and Tees-side.

Yorkshire and Hull – the routes connecting Bradford, Halifax, Huddersfield, Leeds, Wakefield, Barnsley, Sheffield, Doncaster, Hull York and Harrogate.

The four Transpennine routes, via Blackburn, Rochdale, Huddersfield and Edale and their connections to east and west.

North-Western England: to Barrow in Furness, Heysham, Buxton, from Wigan to Southport; and from Deansgate (Manchester) to Allerton, the Cheshire Line between Manchester and Liverpool.

North Wales: Crewe and Warrington to Chester and Holyhead.

The West Midlands: extending the electrified network to Shrewsbury, Kidderminster, Worcester, Hereford, Stratford on Avon, Leamington and Leicester.

The East Midlands and East Anglia: Leicester to Peterborough and Ely (electrifying the Birmingham / Stansted Cross-Country service), and to Ipswich (allowing electric haulage of intermodal trains from Felixstowe) and Nottingham to Lincoln and Grantham.

The list is illustrative and incomplete: we do not focus on the merits or the fine detail of every specific possibility, but demonstrate the far-reaching potential of a network-wide programme.

4.4.11 Network electrification will enable much more electric haulage of freight trains. The routings of many do not follow the main passenger axes, but move between them. Without continuous electrified routes, they use diesels to avoid the inefficiency of changing locomotives part-way. With through electrified routes between origin and destination, electric haulage becomes feasible.

4.4.12 The loading gauge necessary for intermodal freight trains, which is insufficient through many older arched bridges, can be rectified as an adjunct to the electrification programme, increasing the potential for rail freight to serve markets efficiently

4.4.13 We acknowledge that several of the route proposals would require additional traction current supply points to be provided and that the sources of electricity generation will continue to undergo huge changes.

4.5 Infrastructure improvements which strengthen regional networks and, by improving their links with trunk routes, accelerate Inter-City journeys from origin to destination

4.5.1 HS2 would give very quick transits between a few key points and London. It would require many of its users to make significantly longer journeys, by public transport or by car, to reach its terminals than they do to reach stations on the existing network; and not having a car at the far end of a train journey to allow passengers to reach their actual destinations would make it much less attractive for potential users.

4.5.2 Improvements in regional networks which shorten access to Inter-City trains not only give their passengers at least part of the time saving which HS2 would have provided, they give the same time savings to passengers within and beyond the conurbations. These can be a greater proportionate saving in the end-to-end journey time, and they benefit many more people, travelling every day for work and other activities, than the relatively few who make long-distance journeys.

To give an example, a business' manager may travel once a week from Birmingham to London, but ten people who work at the business' base will make the same journey from home and back five days a week: so a saving of ten minutes in the commuter journey to the city centre will save them more time each week than HS2 would give their manager. All the arguments about the manager using the time on the train to work anyway have already been made.

4.5.3 Birmingham and the West Midlands: Using the Curzon Street site as the hub connecting Inter-City and regional services, rearranging and improving the routes into and out of the city for trains in each type, with separate tracks for high speed, long distance trains and for urban and local services, would multiply the capacity of the West Midlands network. The infrastructure improvements needed would be very substantial, but they would be directed to the needs of everyone in the region, not just long-distance travellers.

They would include:

The Curzon Street hub itself, with through platforms for regional trains and terminal platforms for Inter-City, both Cross-Country and to and from London. It is convenient for interchange with the Moor Street lines; and removing the Inter-City trains from New Street would allow more regional trains to run there.

So, segregating fast and slow trains on improved routes approaching the city, by...

dedicating separate tracks to local and regional services for much of the way towards Walsall, an improved Cross-City route north to Aston, their own tracks to International, the Cross-City route south to Barnt Green, the Stour Valley route to Wolverhampton, potentially giving Dudley its own link with this line and much faster access to Birmingham, and

concentrating InterCity trains from London on a new tracks between Hampton- in-Arden and Stechford, with those from Derby joining them on a short new route from Whitacre to Birmingham International, those from Bristol on the Camp Hill route from Kings Norton, and those from the North-West on the old Grand Junction route via Bescot,

would be a strategy for the city and its region with advantages far beyond those available from tactical gestures constrained by the limitations of the existing network. And extensions to the Metro tram network can provide much better services for inner-city suburbs than could infrequent trains competing with others for capacity on shared tracks.

This proposal is clearly a long-term, not an immediate opportunity.

4.5.4 Manchester and North-West England: Rethinking the inner-city network has already begun. Its capacity and performance can only be improved by strategic rather than tactical changes. The same principle of multiplying overall capacity by segregating trains by speed can only be applied on a limited scale, but one substantial option is available:

The use of the Piccadilly / Deansgate two-track viaduct by daytime intermodal freight trains to and from Trafford Park conflicts badly with the high-frequency local passenger service. Other changes are required to correct the performance and, in the longer term, to increase the capacity of the passenger route. A significant contribution towards this could be made by diverting the freight trains to a new route. Its construction between Parkside, on the Liverpool and Manchester line east of Newton-le-Willows, and Glazebrook, on the Cheshire line east of Warrington Central, past Culcheth, and layout changes at Trafford Park would be feasible. It would give freight trains from the West Coast Main Line and the northeast access to Trafford Park without passing through central Manchester, again, to the benefit of all the users of the present routes.

In the long term, a tunnelled route from Piccadilly northwards across the city centre

would serve primarily as part of a new Transpennine route, but it could also accommodate services within the city-region.

4.5.5 Transpennine: Upgrading the existing route via Huddersfield and the Northern

Powerhouse Rail 'HS3' both intend to improve connections between the cities and some of the towns east and west of the Pennines. Both are trying to achieve complex overlapping objectives, but they have been seen as largely separate from each other. We propose that they should be integrated, and seen as single programme to improve the network.

Its single most important element should be a new tunnel connecting the environs of Rochdale with those of Halifax. To the west the routes to Manchester, its Airport, and Liverpool through the city centre should be improvements to the existing railway, with the possibility of adding the Manchester cross-city tunnel. The alignment of the route will facilitate higher speed, and there is space to segregate slower trains and conflicting movements. To the east, substantial improvements to the existing routes can connect the tunnel to Bradford via Halifax, to Leeds, Selby and Hull via Batley, and to York via Wakefield. Services on it should form part of a network of comparable quality, not be an independent answer to inter-linked problems.

The limitation on the savings in journey time that can be achieved via Huddersfield will be circumvented by the construction of that new primary route. But removing the fastest trains from the Huddersfield route will enable it to carry more frequent trains serving intermediate stations.

Improvements to the Hope Valley route via Edale to reduce the impact on its capacity of operating a mix of fast and slow passenger and freight trains along it. Long loop lines can allow freight trains to be overtaken quickly by the fastest passenger trains, improving the service between Manchester and Sheffield.

Other freight movements across the Pennines can similarly be improved by selective improvement to the existing network, integrated with the projects for passenger services.

4.5.6 Yorkshire and Hull: A frequent high-quality regional network connecting Bradford, Halifax, Huddersfield, Leeds, Wakefield, Barnsley, Sheffield, Doncaster, Hull, York can be created from the existing complex but disjointed pattern of services. Infrastructure improvements enabling it are inextricably linked with those for the combined Transpennine Route Upgrade and Northern Powerhouse Rail projects.

4.5.7 North-East England: Extending the Metro to Washington and providing passenger services to Ashington have both been put forward many times before. Both have clear advantages, and should proceed. Both will be served better by extensions of the Metro than by main line railways: frequency of services and access to all of the Newcastle city centre stations as well as those of the rest of the network enable the Metro to meet passengers' needs better than would a conventional train to Newcastle Central station. The capacity of the station and of the main line network, particularly the East Coast main Line northwards, would be inefficiently used if they accommodated relatively short trains meeting the demands of smaller flows: we avoid any symbolic attachment to traditional railways for their own sake. As the Metro has demonstrated ever since it opened, it does the job better.

4.5.8 Scotland: The growing demand for longer-distance commuting from both east and west into Edinburgh requires improvement to the infrastructure approaching Waverley

station. In the east this can be achieved by making two tracks four between Drem and Portobello, segregating faster and slower trains to the advantage of both, and rebuilding Portobello Junction. In the west, electrification from Fife into Edinburgh will benefit not just the substantial local traffic, but also Inter-City services. The east-west freight line avoiding Edinburgh Waverley connects the East Coast and West Coast Main Lines to the opposite ends of the station, and electrification will be valuable in the event of disruption, when it will also facilitate moving trains to and from maintenance depots.

4.5.9 East West Rail and the freight route between Felixstowe and the Midlands: These have been considered until now as separate projects. Neither meets its own objectives very well, and each objective is too narrow to make an economically strong case for implementation. We propose that a single scheme, connecting Oxford, Milton Keynes, Northampton, Huntingdon, Cambridge and Ipswich, which could meet the main demands of both the running projects, should be considered as an alternative. It would meet a wider range of demands, not just between Oxford and Cambridge, for flows between East Anglia and the Midlands and North, for passengers and freight. By combining both on the same infrastructure it would have a stronger economic basis. And it would spread the benefits of East West Rail further north than the congested South-East, to Northamptonshire. The project team is already established, and a broader vision beyond the present limited scope will produce a better outcome.

4.5.10 Trams and buses, interchanges, and car parks: Throughout the regions covered by our proposals, many local projects which can improve rail travel without improving railways themselves are available. Enabling drivers to park their cars and take a train needs no argument in support. Many small-scale local schemes could be implemented quickly if there was the will and the funding to do so. Interchanges which facilitate connections between bus and train services have more scope for productive investment. The integration of bus and rail services to provide seamless journeys regardless of mode has been limited by the 1980s deregulation of bus services. A planned approach under the control of local authorities can be restarted under the framework of bus quality partnerships. Extensions to urban tram networks should be both more effective and more efficient than main line railways at meeting relatively short distance demands and they too should be encouraged.

5 Conclusion

Our proposals have been compiled in response to a negative: the necessity to consider not building HS2. The assumption that the new very fast line would eventually be built has for a decade conditioned thinking about railway improvements everywhere north of London.

While regional transport bodies have put forward tactical changes, and Northern Powerhouse Rail has taken a strategic view, outside Scotland no unquestionably beneficial schemes are ready for early implementation. Proposals that have been developed, in some cases laboriously, have not fully considered the strengths (nor necessarily the weaknesses) of railways, and many of the proposals that exist do not have good business, as opposed to local political, cases.

We have tried to see the opportunity from another perspective, that of the railway network, for which new leadership and structures are urgently necessary. We hope that we have demonstrated the potential that exists and that, if HS2 does not proceed, at least part of the funding that would have been allocated to it can be shared more widely to bring greater benefits to more people who want better railways in the regions of England, Scotland and Wales.

The Authors

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Those who have made this proposal have no connection with any company active either in today's railway or on HS2, and they are not receiving any payment for producing it.

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