House of Commons

Transport Committee

Rail technology: signalling and traffic management

Seventh Report of Session 2016–17

Report, together with formal minutes relating to the report

Ordered by the House of Commons to be printed 17 October 2016

HC 67
Published on 27 October 2016
by authority of the House of Commons

Transport Committee

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Summary

Substantial benefits can be realised by the intelligent deployment of signalling and traffic management technology on the rail network through the Digital Railway programme. Elements of the Digital railway are already in use on some metro lines or on a small scale on the railway; others are being trialled. The Digital Railway programme would accelerate the deployment of such technologies across the entire rail network. In developing and considering the business case for the programme, the Government and Network Rail should not lose sight of the fact that such improvements are not a panacea, that they may not lead to dramatic capacity improvements on all routes, and that moving ahead with caution will help ensure the right interventions are used on the right routes.

Network Rail has a responsibility to keep its plans measured and realistic. If it produces over-ambitious plans that then need to be scaled back, it risks discouraging further investment in the UK by rail technology suppliers. This has happened before, and must not happen again. It is important that the Department for Transport and Network Rail make a realistic assessment of how much extra capacity the Digital Railway can deliver to meet growing demand. The Digital Railway is one of a number of responses to demand for extra capacity. The Department will need to ensure that the most effective and efficient options are deployed on each route. Where the Digital Railway offers the best solution it is important that other work, such as improving station capacity, is done to enable the investment in the Digital Railway to deliver its full potential.

We are encouraged by the prospect of a fully cross-industry delivery plan, and urge Network Rail to ensure that the rhetoric is matched with action. The term Digital Railway does not represent a specific technology but covers a range of systems. While we do not advocate or reject any specific option—such as ETCS Level 2 or Level 3—we do recommend that Network Rail undertakes a full cost/benefit analysis of all potential systems and publishes this work for wider consultation before finalising its strategy. Where relevant, the Digital Railway programme should seek the input of rolling stock owners, both passenger and freight rail operating companies, technology suppliers, and trade unions representing rail workers. It will be impossible for the Digital Railway programme to deliver the benefits it promises without a whole sector approach.

The programme is an opportunity for innovation in a variety of other ways: the use of Rail Operating Centres, how timetables are planned, and how rail infrastructure is financed. These opportunities should be explored as the programme is developed.

We await the business case for Digital Railway with interest.

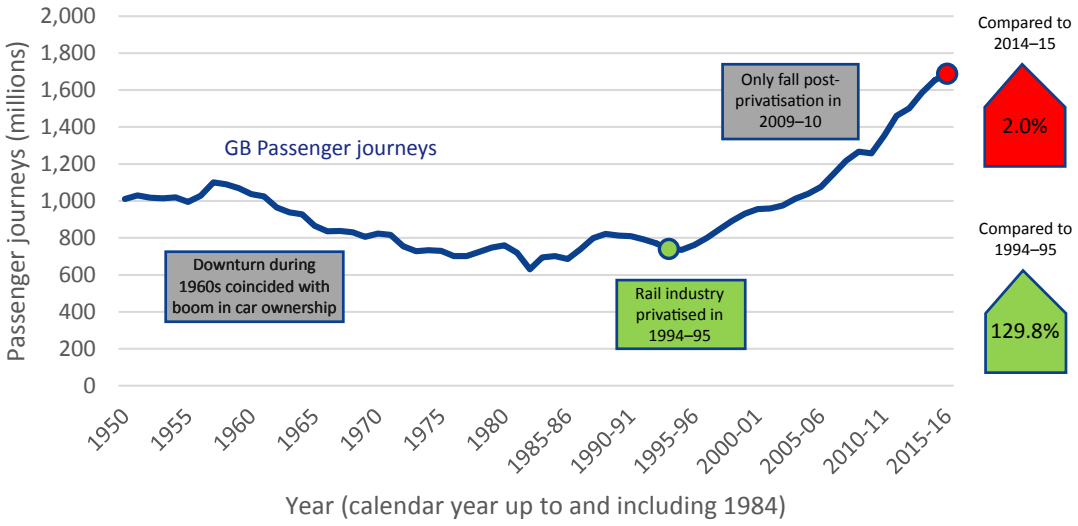
1 Background and context

The urgent need for greater capacity

1. Rail journeys are at their highest level since the 1920s. There were 1.69 billion passenger rail journeys in the UK in 2015–16, which was the highest recorded figure since the Government began collecting statistics on passenger rail use in 1950. This is an increase of 130% from the 735.1 million recorded at privatisation in 1994–95.[1] This increase is expected to continue; by 2030, there are forecast to be an extra one billion passenger journeys a year on the network.

2. Network Rail's evidence painted a picture of urgent need for more capacity, telling us that "despite the fact that 1.5 million more train services run each year than in 1997, passenger demand has outstripped that".[2] This was echoed in the evidence submitted by the Rail Delivery Group.[3]

Figure 1: GB Rail passenger journeys, 1950–present



Source: Office of Rail and Road, Passenger Rail Usage 2015–16 Statistical Release, 26 May 2016

3. The industry's claims are supported by the statistics collected by the Department for Transport. In rail statistics "Passengers in excess of capacity" is the main measure used for overcrowding. It shows the proportion of standard class passengers that are above the capacity on their services at the busiest point. Overcrowding has steadily increased over the last five years. In 2015, 3.8% of passengers were in excess of capacity, rising to 4.4% in London. At particular stations in London the picture is even more alarming, with passengers in excess of capacity rising as high at 14.7% at Blackfriars in 2015,[4] although we note that the capacity of that station will increase significantly upon completion of the Thameslink programme.

1 Office of Rail and Road, Passenger Rail Usage 2015–16 Statistical Release, 26 May 2016
2 Network Rail (RTC0012)
3 A group comprised of Train Operating Companies and Network Rail
4 Department for Transport, Passengers in excess of capacity (PiXC)1 on a typical autumn weekday by city: annual from 2011 (Table RAI0209), July 2016

4. The need for extra capacity to meet growing demand is clear. The Department for Transport and Network Rail can increase capacity on the rail network in a number of ways. Some of these, such as enlarging stations, installing new track, or providing more rolling stock and using longer trains can be prohibitively expensive and do not make the most efficient use of existing assets. One option is to change the signalling system and the business case for a proposal to do just that is being developed; it is called the Digital Railway programme.

5. We launched an inquiry launched in February 2016 to look at the signalling aspects of the Digital Railway programme. Mark Carne, Chief Executive of Network Rail, told us that the approach Network Rail wanted to embrace for this programme was a cross-industry method that transforms the railway, rather than just a signalling replacement programme.[5] This would involve freight and passenger rail operators, technology suppliers and rail staff. We received numerous submissions and heard evidence from Network Rail, the Rail Delivery Group, the Rail Freight Group, Arriva, South West Trains, rail technology suppliers, ROSCOs, trade unions, and the Department for Transport. We thank all of those who took the time to submit evidence to our inquiry. All of the evidence we received is listed at the end of this report and can be found on the Committee's web pages.

6. The parts of Digital Railway programme concerned with open data for software developers and information customers were not the focus of this inquiry and are not explored in this report. We did consider some of these issues in our recent report on the rail passenger experience.[6]

Rail signalling today

7. Most of the UK's rail network uses signals at the side of the track to control the movement of trains from one section of track to another. While these can be supplemented by automatic train operation technology in the drivers cab, it is fundamentally "lights on sticks" beside the track that tell a train driver whether they can move.

8. Signals that divide the line into sections, known as blocks, and trackside equipment that detects when a train is in a particular block are used to create a "fixed block" signalling system. A train is allowed to enter a block only once the train ahead has vacated it and it can only move as far as the next stop signal. Signals are spaced to safely accommodate the fastest trains with longest braking distances on a particular route. Trains on the same route with shorter braking distances are not able to travel closer together (which would mean greater capacity on the line) as they are limited to the fixed blocks; capacity on a line is in effect limited by the trains with the longest braking distances.[7] Blocks vary in length, but the average distance in high capacity urban areas is between one and one and a half miles.[8]

9. The signalling system only knows whether a train is in a block or not; other information such as the speed of a specific train, its location within the block or its braking capability

5 Q15 [Mark Carne]

6 Transport Select Committee, The future of rail: Improving the rail passenger experience, Sixth Report of Session 2016–17, HC64

7 Network Rail (RTC0012)

8 Network Rail (RTC0012)

are not collected or used. The technology that manages this kind of signalling has changed over the years but the principle of fixed block signalling is largely unchanged from 1889 when block signalling became mandatory.[9]

10. In a fixed block signalling system trains can travel more closely together by reducing headway. Headway is the time interval that must be left between trains on a line in order to travel safely. In fixed block signalling systems all that is known about a train's position is that it is somewhere in a particular block. To keep the line running safely, a system must assume that it is at the start of the block and the following train must have a headway that allows it to come to a full stop without encroaching into an occupied block. Having to assume that a train is at the start of an occupied block leads to headways being longer than they need to be.

Modern railway signalling

11. New standards for signalling have emerged largely as a result of the need to improve safety, enhance reliability and safety, facilitate cross-border traffic in Europe, and manage the costs of running and maintain the railway. These comprise a system for controlling train movement, a radio network for voice and data communications, and software to manage traffic on the rail network. The technologies involved are discussed briefly below.

ETCS and ERTMS

12. ERTMS is the European Rail Traffic Management System developed under the guidance of the European Commission by UNISIG.[10] It has two basic components: the European Train Control System (ETCS) and GSM-R. The development of ERTMS is based on the need for interoperability within the European rail system. This requirement for interoperability is set out in EU Directive 1996/48 on the interoperability of high speed trains, and EU Directive 2001/16 on the interoperability of the rail system. Both establish the need for a common technical specification in EU law, making it an obligation for any new or upgraded tracks or rolling stock to be compatible with ETCS. The Directives were implemented in UK law by the Railways (Interoperability) Regulations 2011, which came into force on 16 January 2012.

13. When asked whether the UK leaving the European Union would have effects on the deployment of traffic management and signalling technologies, Claire Perry MP, the then Rail Minister, told us that "there is no Brexit issue".[11] David Waboso, Managing Director of the Digital Railway programme at Network Rail, added that he did not think there was "any issue at all". ERTMS has established itself as a worldwide standard, and according to UNIFE,[12] ERTMS investments outside Europe represented more than 45% of the global ERTMS investment worldwide in 2014.[13]

9 Regulation of Railways Act 1889 (52 & 53 Vict c 57)
10 An industrial consortium which was created to develop the ERTMS/ETCS technical specifications
11 Q233 [Claire Perry]
12 A trade organisation representing the European rail manufacturing industry.
13 UNIFE, "ERTMS deployment outside Europe: ERTMS as a global standard", 2014

14. **The European Rail Traffic Management System is becoming a global standard. While the UK will presumably no longer be bound by EU Directives when it leaves the European Union, it would be counterproductive and costly not to continue using the same standards as used in the rest of Europe and the wider world.**

15. ETCS differs from fixed block signalling by providing intermittent or continuous data transmission from the train to a control centre using traffic management software. Data on a train is used by traffic management software in order to decide on the train's movement authority (permission to proceed). ETCS can be deployed in levels 1, 2 or 3. Level 1 is not a full deployment and still uses trackside signals for movement authority. In ETCS Level 2, which is currently available for deployment, all movement authority is continuously updated by trains sending their current position and status to a Radio Block Centre (RBC). Track-side equipment is still needed for train detection when using Level 2. In ETCS Level 3, which is not currently available, all track-side signals and train detection equipment is replaced by equipment on-board the train.

16. For both ETCS Levels 2 and 3, track-side signals are replaced by displays inside the driver's cab. Trains monitor their position using on-train sensors and balises (electronic beacons) fixed to the track. They report their location and speed to a radio block centre (RBC) via radio transmissions. The RBC receives information from all trains in a particular operating area, allowing it to map the traffic on the network. It checks that a route is clear, reserves it for a particular train and then transmits a movement authority (and other information) directly to the driver's cab.

17. It is Level 3 that is the basis for Network Rail's most dramatic claims for potential increases in capacity. Network Rail's Wessex Route Study modelled the effect of ETCS Level 3 on the South West Mainline into Waterloo, and found that Level 3 in conjunction with a traffic management system could deliver up to 40% more trains per hour at a 30% lower cost than conventional line construction.[14]

Voice and data communications

18. GSM-R is the telecommunications standard that trains and radio block centres use to communicate. It uses second-generation (2G) mobile technology that in consumer electronics is now largely obsolete. Most countries, including the UK, now have national GSM-R networks. However, 2G technology is an aging technology and will not be supported in the long term future. Guarantees exist to ensure the supply of equipment until 2025 but, after that, commercial considerations will determine how long the supply base will exist.

Traffic management software

19. Radio Block Centres use traffic management software to decide on the most efficient arrangement of trains on the network. Such software can be deployed in individual Radio Block Centres, or in larger Rail Operating Centres.

20. Collecting additional information and feeding that into a traffic management system can reduce headways and increase capacity on a route. The ideal of a moving block

14 Network Rail, Wessex Route Study, 2015

signalling system would have headways equal to the minimum safe stopping distance between trains, varying according to their speed, position and braking distance, and would adjust signals in real time in order to make the most out of the route.

Driver Advisory Systems

21. A Driver Advisory System (DAS) is a cab-based system that tells a driver the speed they should travel in order to make most efficient use of their fuel. In its most basic form, it does not take into account other trains on the track, and simply has the route information loaded prior to the journey. These systems have historically been deployed as energy efficiency measures, promoting the best use of fuel by avoiding sudden braking.

22. A "connected" Driver Advisory System (C-DAS) differs from this basic system by establishing a communications link between the train and a Radio Block Centre or Rail Operating Centre, and using data on other trains on the line or signals ahead to tell the driver what speed they should travel (often to ensure greatest fuel efficiency). It is not a signalling system and does not relay movement authority to trains.

23. A C-DAS was first introduced on UK routes on the South West Trains franchise, operated by Arriva. Christian Roth, managing director of South West Trains, told us that C-DAS was the right improvement for certain routes "where capacity is not the key constraint".[15]

The Digital Railway programme

24. The Digital Railway programme is a cross-industry plan to accelerate the modernisation of signals, as well as bring in a number of other technical innovations. Re-signalling work is usually done only when current infrastructure reaches the end of its service life. On this basis it would take nearly fifty years for a new signals to be deployed across the entire network. SmarterUK told us that the 50 year timeline "lacks the pace, prioritisation and scope"[16] to meet the rising demand in rail capacity.

25. A substantive business case for the programme will be published later this year. Network Rail's publicity for the Digital Railway claims the programme could achieve up to a 40% increase in capacity by replacing signalling and traffic management infrastructure now rather than at the end of the life of current assets. This new proposal would see all trains fitted with ETCS technology by 2024, all signals "Traffic Management enabled" by 2024, and all signals "ETCS-enabled" by 2029.

26. The Rail Delivery Group told us that the following factors were "essential in meeting" the target dates in the new proposal:

- a realistic rollout plan, involving Network Rail routes, passenger and freight train operators and local stakeholders;
- simplification, consistency and automation of the infrastructure design process;

15 Q58 [Christian Roth]
16 SmarterUK (RTC0013)

- alignment of industry funding and incentives, to ensure that technologies are rolled out to complement each other and the full benefits of the whole system are achieved;
- a national and stable cross-industry programme to support the implementation of the Digital Railway, with fully transparent governance;
- funding for the Digital Railway Programme within the current Control Period, CP5 (2014–19), to ensure that the programme is developed to allow individual projects to start delivering early in CP6 (2019–24).
- a plan that gives the rail supply chain confidence.

27. The Rail Delivery Group told us that they believed this deployment plan was "a cost-efficient option", but that it "did not take due account of the benefits that ERTMS will bring to the wider industry, nor of operational challenges, the impacts of retrofitting rolling stock or the benefit of concentration of a consistent signalling system in one area".[17] The Rail Delivery Group pointed out that digital signalling technologies had not been retrofitted across a rail network as complex as the UKs anywhere else in the world.[18]

28. Mark Carne said "I want to be really clear that my belief is that the digital railway will be a lower cost option for delivering the capacity that this country needs. This is a way of saving money and delivering the benefits faster than the other alternatives. That is going to be the fundamental business case. It is going to be lower cost and you are going to get the benefits faster. That is what we want to prove to you when we bring the business case back at the end of the year".[19] Most of the submissions to this inquiry agreed that there were benefits to the development and deployment of signalling and traffic management technology as set out in the Digital Railway plan. Aside from the capacity improvements, these ranged from improvements to the safety of trackside workers due to a reduction in trackside infrastructure[20] to using traffic management technology to improve timetable planning.[21]

29. **We conclude that improvements to signalling and traffic management technology are needed to deliver a world-class rail network in the UK. In principle we support the idea that the deployment of the European Train Control System (ETCS), Traffic Management software and Driver Advisory systems should be accelerated but this should be subject to careful consideration of the Digital Railway business case, clarity about funding, and a clear understanding of how this programme would affect existing plans for work on enhancements and renewals. In particular, Network Rail's Digital Railway business case should include a full cost/benefit analysis of all potential systems for a particular route, and consult upon it, before finalising its Digital Railway strategy.** We explore this point further in Chapter 3.

17 Rail Delivery Group (RTC0006)
18 Rail Delivery Group (RTC0006)
19 Q46 [Mark Carne]
20 Institution of Railway Signal Engineers (RTC0004)
21 For example, Tracsis plc (RTC0009)

2 Confidence in Network Rail

Network Rail's recent history

30. In September 2014, Network Rail was reclassified as a public company. It could therefore no longer borrow from private lenders and investors, which had been the means by which it funded significant changes in expenditure on existing or new projects. With reclassification came a requirement for a greater level of financial discipline. Network Rail now borrows direct from the Government with a defined borrowing limit set by HM Treasury. Network Rail was recently criticised by the Committee of Public Accounts for its failures to adequately plan its investment programme in Control Period 5 (2014–19). The Committee's Report said that Network Rail and the Office of Rail and Road "agreed an unrealistic programme of rail investments for 2014–19. The programme contained too much uncertainty around the costs of many large projects when it was signed off".[22] Mark Carne told us that Network Rail had been criticised "quite rightly".[23]

31. The Office of Rail and Road's most recent efficiency and financial assessment of Network Rail covers the second year of Control Period 5 (2014–19), and takes into account adjustments following the Sir Peter Hendy's report to the Secretary of State for Transport on the replanning of Network Rail's investment programme. The ORR's assessment showed that Network Rail spent more on network operations on all routes than the regulator's previous assumption, the largest variances in Sussex and East Midlands being 67% and 44% higher respectively.[24] In total, the report shows that Network Rail spent £161m less on enhancements than had been assumed in the ORR's PR13 determination, though this was due to £340m worth of work being deferred to a later time as part of the Hendy review process. By the end of CP5, the total amount of renewals work that will be deferred to a later date is forecast by Network Rail to be to the value of £3.1bn. On publishing its report, the ORR said that "Network Rail will be in a worse position financially at the start of the next control period than we expected, increasing the financial pressure on CP6".[25]

32. The Bowe report into the planning of Network Rail's Enhancements Programme 2014–19 was published at the same time as the Hendy review. It called the problems that have arisen with rail infrastructure investment in CP5 "significant and of deep concern".[26]

33. Sir Peter Hendy's report identified "inadequate planning processes both within and outside Network Rail" as one of the reasons why costs for Control Period 5 had increased beyond expectation. While the report did not recommend the cancellation of any projects outright, it set out a number of projects that would no longer be delivered by 2019. This included projects related to rail signalling and traffic management technology

34. **Network Rail's recent history of planning major enhancements work is poor. In producing a plan for the deployment of rail technology, it must be mindful of the consequences and impact of further failures.**

22 Committee of Public Accounts, Ninth Report of Session 2015–16, Network Rail's 2014–19 investment programme, HC 473, 20 November 2015

23 Q5 [Mark Carne]

24 Office of Rail and Road, Efficiency and finance assessment of Network Rail for 2015–16, August 2016

25 Office of Rail and Road, Efficiency and finance assessment of Network Rail for 2015–16, August 2016

26 Department for Transport, Bowe review into the planning of Network Rail's enhancements programme, 2014 to 2019, November 2015, p 42

Cuts to the ETCS cab fitment fund

35. Network Rail funds the development of a design for on-board ETCS technologies for each class of locomotive or trainset (including any sub-class variants). These are known as first-in-class designs. The ETCS cab fitment fund is intended to "facilitate the inclusion of migration to ETCS operation as a requirement in new franchises through funding and supporting the development of First-In-Class design solutions".[27] It was intended to accelerate the move to ETCS-enabled cabs, a key part of the Digital Railway plan. So far just one First-In-Class design and fitment contract has been let for passenger trains.[28] Tim Gilbert, Engineering Director at Porterbrook Leasing, told us that the lead time from the initial first-in-class deployments to fitting the entire fleet would be three and a half to four years.[29]

36. The Hendy review led to the revision of the programme for Control Period 5. The Enhancements Delivery Plan update published in March 2016 said that both the ETCS Cab Fitment Fund and ETCS Infrastructure projects will have "significant delivery in CP5 and completion in CP6". The value of the cab fitment fund in CP5 has been revised from £194m to £133.5m in 12/13 prices, with the remainder of the original CP5 fund value now planned for CP6. While this still fits within the Digital Railway proposal to have all cabs ETCS-enabled by 2024, it represents a delay of 5 years from the pre-Hendy plans for this fund; the ETCS fitment is now very likely to continue into CP6. In their written evidence, the Rail Delivery Group stated that reduced funding for the cab fitment plan could cause further delays in CP6, and said that additional funding for cab fitment should be made available in CP5.[30]

37. Hitachi Rail Europe told us that these changes "will inevitably create uncertainty about the entire delivery of the Digital Railway".[31] Tim Gilbert told us that prior to the reduction of the cab fitment fund, Porterbrook were planning to contract for ten first-in-class fitments over the course of CP5, but that with the reduction of the fund only five fitments will take place, though this will fit in the timescale of the East Coast Main Line, where this rolling stock will operate.[32]

38. **Cuts to the cab fitment fund may delay the procurement of first-in-class fitment for all rolling stock. Given these cuts, the business plan for Digital Rail should make clear how first-in-class design and cab fitment will be funded. The Department should track how quickly cab fitment is progressing, how changes in funding affect the rate of cab fitment and what implications the rate of progress has for realising the promised increase in capacity.**

39. ***We recommend that the Department for Transport take steps to ensure that work on cab fitment and trackside infrastructure remain broadly aligned; it would be disappointing if trackside infrastructure was ready but could not be used because cab fitment had not progressed quickly enough or vice versa.***

27 Network Rail, Enhancements Delivery Plan, March 2016
28 A contract between Alstom and Eversholt Rail Group for design and installation of ETCS equipment in Class 365s
29 Q179 [Tim Gilbert]
30 Rail Delivery Group (RTC0006)
31 Hitachi Rail Europe (RTC0024)
32 Q183 [Tim Gilbert]

Supplier confidence

40. The rail technology supply chain has had its confidence eroded by a series of procurement cancellations and programme revisions by Network Rail. The impact of these actions were set out in the evidence given to us by Alstom, a major rail technology firm developing ETCS solutions. They told us that Network Rail issued a series of tenders worth in excess of £1 billion for various signalling and traffic management projects, as a result of which the supply industry "invested to scale up their in-country/for country capability and resources to deliver these programmes and has spent millions in bidding for these opportunities only for them to be cancelled, put on hold or scaled back massively".[33]

41. We were told that Network Rail first issued the OJEU Notice[34] in July 2009 only to cancel the programme in March 2015.[35] The aborted procurement of the National TMS Programme (the process for deploying a traffic management system at rail operating centres was suspended in 2015) was cited by a number of respondents as an example of actions by Network Rail damaging the confidence of the supply chain.

42. These aborted plans have had an impact on the willingness for the supply chain to invest in the UK, and an impact on the skills in the UK rail technology industry. Hitachi Rail Europe told us that industry had the right skills but not to carry out innovation work on the scale required.[36] Alistair McPhee, Vice President of Ground Transportation Systems at Thales, told us that the cancellation of the National TMS programme had caused "difficulty in keeping people",[37] while Nick Crossfield, Managing Director UK and Ireland, at Alstom, said that this decision "makes the UK potentially less attractive".[38] Mark Carne told us that he thought it was the "right decision" to cancel the National TMS Programme, because the cost of the programme as tendered was very high.[39]

43. **The Digital Railway business plan is an opportunity to regain eroded industry confidence. Network Rail must be mindful of the damage that will be done to supplier confidence if another technology procurement is started only to be halted or abandoned. When planning the Digital Railway programme the Department and Network Rail should consider carefully the risks arising from any further erosion of supplier confidence.**

44. Hitachi Rail Europe told us that supplier input into the Digital Railway programme was limited. It said "in order to deliver the accelerated Digital Railway proposals, more extensive supplier collaboration is required at a technical level, and decision-making level within the Steering Group".[40] Mark Carne told us that it was "not a Network Rail project. This is a rail industry transformation project".[41] The Rail Delivery Group has members who are chief executives of passenger and freight train operating companies and Network Rail, but does not have supplier members. When we took oral evidence from Thales,

33 Alstom UK&I (RTC0020)
34 The first stage in the EU procurement process, an OJEU (Official Journal of the European Communities) Notice is a mandatory notice for advertising for tenders above certain values in the European Union.
35 Roger Ford FCILT Companion IRSE (RTC0002)
36 Hitachi Rail Europe (RTC0024)
37 Q164 [Alistair McPhee]
38 Q164 [Nick Crossfield]
39 Q15 [Mark Carne]
40 Hitachi Rail Europe (RTC0024)
41 Q9 [Mark Carne]

Alstom and Siemens Rail Automation, we put this issue to them. Paul Copeland, Managing Director at Siemens Rail Automation, told us that "it is vital that we are consulted on any process of moving technology forward".[42]

45. **The Digital Railway programme cannot be delivered without a cross-industry approach. Technology suppliers are clearly fundamental to a modern rail network. We recommend that Network Rail address the concerns expressed in the evidence we have taken that suppliers and the rail technology industry have not been sufficiently involved. Network Rail and the Department for Transport should take steps to ensure that the views of suppliers and the rail technology industry are heard in consultations on the potential, scope, and cost of projects. It is important that work on the Digital Railway is co-ordinated and is underpinned by a whole sector approach.**

"40% more capacity" and other claims

46. The claim that ETCS will provide up to 40% greater capacity is based on modelling from a study that considered three high-level options for the area of the South West Main Line between Surbiton and Waterloo. The third of these options, "accelerating the introduction of ETCS/ATO", was found to provide the necessary 60% additional capacity when coupled with Crossrail 2. The findings suggested that the implementation of ETCS level 3 in conjunction with Automatic Train Operation (ATO)[43] between London and Woking could enable up to 34 trains per hour, increasing from 28 trains per hour.[44] The remaining increase in capacity would be obtained by other improvements on the line.

47. The evidence that we received from TOCs and suppliers (both of whom stand to gain from the proposed programme) supported the Digital Railway proposal with one respondent calling it "transformational".[45] We heard some dissenting voices from those currently outside the industry bubble. Roger Ford, digital and technology editor of *Modern Railways*, said that the concept was "based on unrealistic claims, such as the potential to increase capacity, which are not supported by experienced signal engineers and railway operators".[46] Dr Alan Cribbens, a former British Rail signaller and current consultant, said that "the much-vaunted advantages of ETCS should be treated with caution", emphasising that Level 2, the specification currently available, does not allow moving block operation.[47] The Institution of Railway Signal Engineers (IRSE) told us that "claims as high as a 40% improvement have been stated, and whilst this might be achievable in a few situations, this is significantly more than will be achievable in the majority of cases".[48]

48. Mark Carne pointed out that at no point did Network Rail claim that 40% "is universal, it is not".[49] In a later evidence session, David Waboso of Network Rail, warned against an "over-heroic" approach that attempted to achieve too much in early deployments.[50]

42 Q134 [Paul Copeland]
43 A system that automatically starts and stops the train according to the signal being shown.
44 Network Rail, Wessex Route Study, para 5.4.84
45 Alstom UK&I (RTC0020)
46 Network Rail, Wessex Route Study, para 5.4.81
47 Dr Alan Cribbens Consulting (RTC0003)
48 Institution of Railway Signal Engineers (RTC0004)
49 Q5 [Mark Carne]
50 Q222 [David Waboso]

49. The claim of 40% more capacity being possible with the Digital Railway may be misleading, and the kind of "over-heroic" attitude that David Waboso rightly warned should be avoided. **Over ambitious claims for improvements in capacity must be met with scepticism, and Network Rail should be very cautious about how it uses the 40% claim. *The Department should be very clear about the level of capacity improvement likely to be achieved when assessing the business case for the Digital Railway. It should consider alternative ways of achieving the same level of growth in capacity so that it can make an informed decision on the likely cost/benefit ratios and funding for the Digital Railway. Rather than claims of up to 40% we expect to see a more sophisticated assessment of the likely capacity gains that look at different investment scenarios and their associated costs, benefits and risks. It is important that the Department for Transport and Network Rail make a realistic assessment of how much extra capacity each system within the Digital Railway programme can deliver to meet growing demand. Where the Digital Railway offers the best solution it is important that other work, such as that needed to improve station capacity, is done simultaneously to enable the investment in the Digital Railway to deliver its full potential.***

50. Network Rail's publicity for Digital Railway promotes the benefits of a moving block system that is neither currently available nor being proposed to be installed.[51] The publicity surrounding Digital Railway claims that the fixed block system of railway signalling is outdated, and that updating to ETCS technology is "updating our Victorian legacy".[52] It important to note that ETCS Level 2, which would be deployed first unless a decision is made to proceed directly to a Level 3 system, is still a fixed block method of signalling. It is not a moving block signalling system, and achieves a capacity gain by reducing headway (through the possibility of shorter blocks). Moreover, Level 2 would still require expensive trackside equipment, whereas a Level 3 system does not necessarily require such capital investment.

51. **Projections based on ETCS Level 3 should only be considered valid when the Level 3 specification is ready for deployment, and Network Rail should avoid using such projections, or the promise of a "moving block" signalling system, in its publicity until such technology is ready to be deployed.**

Delays to ETCS and Traffic Management roll out

52. There are 12 Rail Operating Centres (ROCs) that will eventually cover the entire rail network as signalling responsibilities are moved away from over 800 local signal boxes. The ROCs at Rugby, Manchester, Basingstoke, Romford and Three Bridges are newly constructed. At the beginning of June, Claire Perry MP said that Thales's ARAMIS traffic management system would be fully integrated at the Romford ROC by November. This could mean lower headway and greater capacity on the part of the network that the ROC manages. However, according to media reports, Network Rail has now said that despite the TMS being "close to completion", the infrastructure owner needs more time to "iron

51 "In the UK today, it is rare for train paths and speeds to be controlled automatically. Instead, traffic is controlled through a mix of systems, chiefly based on 'fixed block working' delimited by physical signal locations. However, a digital approach is able to remove the fixed block constraint altogether." Network Rail, "Digital Railway Discussion Pack", page 11

52 Network Rail, "Digital Railway Discussion Pack"

out the final software bugs, complete the training of staff, carry out trial operations on the simulator and enable the development of our staff's capability and confidence in using the new system".[53]

53. This is not the only project related to Digital Railway that has already been scaled back. In July, David Waboso announced that Network Rail would revise the proposed ERTMS installation on the Norwich–Yarmouth–Lowestoft pilot, which was being designed to show how digital technology could be fully deployed by the end of CP5. Mr Waboso cited the urgent need to complete the re-signalling of that line by 2019 at the latest. This means that the re-signalling will not be a full ERTMS deployment but will instead be fully "digital-ready".[54]

54. These delays can be considered a blow to the Digital Railway plan in its earliest stage. Both of these projects were named in prominent pieces of written evidence as examples of the forward plan for Digital Railway.[55] In the Department for Transport's written evidence, the Department said that it was "working with NR to consider options for 'early deployment' of the Digital Railway programme on the Norwich–Yarmouth–Lowestoft route. Network Rail are keen to fully test their proposition on a mainstream part of the railway to test the concept, technology and implementation and to demonstrate benefits to the wider industry".[56] It is therefore surprising that this pilot is being revised. Network Rail has set itself a target of completing the deployment of ETCS and traffic management technology by 2029, which is seen as ambitious, and revisions or delays at this early stage are not encouraging.

55. Concern that there is a lack of a clear forward plan was raised by a number of respondents, including Christian Roth of South West Trains, who told us that this sort of late change is harmful to the success of the programme, and that "halfway through roll-out, the railway industry quite often changes its approach too much".[57] Siemens Rail Automation also highlighted the "significant delay to the reward of contracts for the roll-out of ETCS on the East Coast Main Line"[58] as an example of the lack of a clear plan. Hitachi Rail Europe also cited concern that "at present, there is too much uncertainty around Network Rail's proposed accelerated programme".[59] As well as harming confidence in suppliers, a lack of a clear onward plan may also lead to a lack of political will to unlock the large scale capital investment required to adequately deliver the programme. While the Department for Transport agrees that the programme of ERTMS deployment "needs to be accelerated", the Department emphasises that they will act only "subject to a satisfactory business case".[60]

56. **It is important that projects are flexible, and re-signalling works should not be held to an artificial timetable when a delay is required for legitimate reasons. Nonetheless, we have some concern that the recent announcements of delays in both the Romford ROC and the Norwich–Yarmouth–Lowestoft line may be early indications that the timetable that Network Rail has set for Digital Railway is over-ambitious and will not**

53 Rail Technology Magazine, Network Rail to delay fully integrated TMS at Romford ROC, 2 August 2016
54 Rail Technology Magazine, Network Rail to delay fully integrated TMS at Romford ROC, 2 August 2016
55 Network Rail (RTC0012); Department for Transport (RTC0001)
56 Department for Transport (RTC0001)
57 Q56 [Christian Roth]
58 Siemens Rail Automation (RTC0005)
59 Hitachi Rail Europe (RTC0024)
60 Department for Transport (RTC0001)

be met. We look to Network Rail to be realistic and measured in the time frame that it sets in the business case for Digital Railway, even if this means rowing back from the 2029 target.

London Underground experience

57. ETCS technology has been in use on the Transport for London (TfL) network for some time, and provides a good example of the benefits that can be realised. In March 2016, David Waboso was appointed Director of the Digital Railway programme, previously London Underground Capital Programmes Direct at Transport for London. In his previous role, Mr. Waboso presided over a signalling upgrade to the Victoria line, increasing the frequency of trains from 24 to 36 per hour throughout most of the line. Transport for London noted that there were other benefits, pointing out that "London Underground is now more than 50 per cent more reliable".[61]

58. Metro systems are the main areas in which ETCS is already used on the UK rail network. A metro system is very different to mainline rail. They will usually have only one type of rolling stock, a simple route and one speed of running, none of which can be assumed on main line routes.

59. In an evidence submission that was otherwise sceptical of Network Rail's claims, Roger Ford cited David Waboso's appointment as one that "brings extensive signalling experience to Network Rail".[62] Paul Copeland also said that Mr. Waboso's appointment was the "first step" to providing confidence to the rail technology industry that Network Rail can deliver the Digital Railway plan.[63]

60. **The appointment of David Waboso to head Digital Railway is an encouraging sign that signalling expertise will be used to inform the Digital Railway programme.**

61 Transport for London (RTC0022)
62 Roger Ford FCILT Companion IRSE (RTC0002)
63 Q139 [Paul Copeland]

3 Digital Railway's strategy

Making choices

61. Different routes will have different issues and solutions that work for one might not work for another; a blanket approach is not possible. As well as deciding when and how intervene, Network Rail will have to choose whether to press ahead first with a Traffic Management and C-DAS solution (such as that used on the South West Trains franchise) or with ETCS deployment. If the latter, there is a further choice of whether to deploy ETCS Level 2 or to wait for the development of Level 3.

62. David Waboso made clear that the decisions on where enhancements would be implemented would be made on a case-by-case basis, and that there is no one-size-fits-all solution to deploying the Digital Railway plan.[64] The ORR agreed that "the benefits of digital railway vary by route and within route, so decisions on deployment might sensibly reflect this".[65] The Rail Delivery Group warned of the need to avoid "the creation of a patchwork of ETCS 'islands', where ETCS was fitted rather than creating logical lines of route"[66] as one of the challenges facing the ETCS roll out plan.

63. In their written evidence, Thales said that the UK was an "ideal" market for Traffic Management and signalling technology to be "de-coupled", with separate deployment schedules. Their argument was that doing so would significantly improve overall delivery times and more readily provide benefits to passengers, such as the provision of real time information for journey planning.[67]

64. Christian Roth told us about South West Train's experience as the first franchise on which a Connected Driver Advisory System has been deployed in the UK. He argued that "there is too much discussion about various types of technology" and that

> "what we need to get to is what is called automatic train operation, and that could be achieved with level 2 or level 3 […] Level 2 would definitely give more capacity, but it is not only about providing signalling technology; a number of supporting conventional infrastructure interventions would be required, like de-conflicting junctions, flyovers or freight separation of trains. It is not only about new signalling equipment; it is about a holistic approach and how to get more capacity on the railway."[68]

Asked whether he felt it would be more appropriate to focus on traffic management solutions while waiting for ETCS Level 3, he answered that it would depend on the route, and the approach taken on the South West Trains franchise would not be appropriate on all routes.[69]

65. C-DAS technology needs to interface with a compatible traffic management system; without this C-DAS does not appreciably increase network capacity. The technology

64 Q213 [David Waboso]
65 Office of Rail and Road (RTC0028)
66 Rail Delivery Group (RTC0006)
67 Thales UK (RTC0019)
68 Q58 [Christian Roth]
69 Q59 [Christian Roth]

suppliers who would develop such a solution were also asked whether it might be more appropriate to push ahead with traffic management solutions while waiting for ETCS Level 3, to which replies were varied.

66. Echoing Thales' written evidence, Alistair McPhee of Thales told us that traffic management should go ahead "sooner rather than later", citing the impact that traffic management deployment has had in Germany.[70] Nick Crossfield of Alstom differed slightly, claiming that traffic management alone would only give an "incremental" increase in capacity, whereas traffic management linked with ETCS would provide a "structural" increase.[71]

67. It is important to note that both of these witnesses have a direct interest in promoting one strategy or another of deployment, for the benefit of their firm. Department for Transport officials had a more balanced response. Brian Etheridge told us that individual routes would be appraised objectively according to the Treasury's appraisal mechanism,[72] and David Waboso assured us that on many routes there will be "a mix of technology, whether it is traffic management or level 2 overlay, or whether potentially it is best to wait for level 3".[73]

68. **Network Rail is right not to present the Digital Railway proposal as a plan to fit ETCS Level 2 across the network; it might not be the appropriate intervention for every line. We recommend that Network Rail keep an open mind in its strategy, pick the most effective intervention for each route, and look to press ahead with Connect Driver Advisory systems and Traffic Management solutions where these are cost-effective.**

69. It is not accurate to say that ETCS Level 3 is purely hypothetical, as it has been in development for some time. However, Level 2 can be deployed now, while Level 3 cannot. Some witnesses suggested that there was little appetite for waiting for Level 3 to be developed before starting deployment of ETCS technology. Nick Crossfield told us that "an upgradable level 2 system provides us with the most sensible route to level 3".[74] This was supported by Alstom's written evidence, which expressed concern that the Digital Railway programme "is spending a lot of time considering the "art-of-the-possible"[75] in developing the vision for Phase 3 of the Digital Railway. During our inquiry, however, it was suggested that Level 3 technology could be developed much more quickly if there was a proper and concerted focus upon it in the Digital Railway programme. In addition, as Level 3 potentially avoids the need for an expensive capital investment in lineside equipment, it is important for Network Rail to include in its Digital Railway business case full analyses of the costs, benefits and potentials of both options.

70. It is unclear how long it will be before the specification for ETCS Level 3 is agreed on. The Rail Safety and Standards Board (RSSB) told us that "new digital technology should be deployed as quickly as economically possible, so that the benefits can be realised sooner".[76]

70 Q142 [Alistair McPhee]
71 Q142 [Nick Crossfield]
72 Q209 [Brian Etheridge]
73 Q213 [David Waboso]
74 Q142 [Nick Crossfield]
75 Alstom UK&I (RTC0020)
76 RSSB (RTC0007)

The Institution of Railway Signal Engineers was measured in its approach, supporting the benefits that Level 2 and traffic management solutions will bring, but warning that "more effort should be expended in developing and deploying ERTMS Level 3".[77]

71. **While there is no reason to keep all re-signalling work on hold while waiting for ETCS Level 3, we support the continued development of that system and request that Network Rail undertake a full cost/benefit system of introducing that system directly as opposed to evolving to it from a Level 2 system. As part of that analysis, we recommend that any assessment of a Level 2 system should require input from potential suppliers on the feasibility and costs of upgrading to Level 3.**

Passenger and freight rail

72. While in recent years there has been a decrease in bulk commodities carried by freight, particularly coal,[78] rail remains a significant transport mode for freight. The concerns of freight with regard to re-signalling projects are quite different to passenger rail. While the benefits of ETCS can be seen on London Underground lines, these did not have large, slow freight trains running on them. We were told by Claire Perry that the requirements of the freight industry were "fundamental"[79] but Brian Etheridge, Director of Network Services, Rail, at the Department for Transport, said "there has to be an industry solution".[80] This is because the freight industry traditionally has very thin margins, so the money for investment in new technology "is not always there". When asked on the rail industry's plans for fitment, Claire Perry told us that "we have not talked enough to the freight industry about their plans to do cab fitments".[81]

73. There is a danger that freight will fail to benefit if industry is unwilling to invest in new technology, or if solutions that are well suited to passenger lines do not take into account the needs of freight. Nigel Jones of DB Cargo and the Rail Freight Group told us that he thought it was true that there was a lack of enthusiasm for fitting ETCS in freight cabs, and that "it is really difficult to offer customers 21st century solutions when the underlying technology of the industry is at best 20th century, and sometimes 19th century".[82]

74. **The rail freight industry must not be forgotten in the deployment of signalling and traffic management technology, either by the failure to be accounted for in Network Rail's plans, or by a lack of will on the part of the industry to invest in new technology. The Department and Network Rail should continue to have discussions with the Rail Freight Group to discover ways in which ETCS cab fitment in freight can be accelerated in line with passenger rail. We welcome the Government's commitment to do this in the recently published Rail Freight Strategy.**[83]

77 Institution of Railway Signal Engineers (RTC0004)
78 Department for Transport, Rail freight Statistical dataset Table RAI0401 (TSGB0422)
79 Q226 [Claire Perry]
80 Q226 [Claire Perry]
81 Q226 [Claire Perry]
82 Q106 [Nigel Jones]
83 Department for Transport, Rail Freight Strategy, September 2016

Rail staff and Digital Railway

75. Any rapid deployment of new rail technology could require staff to be retrained *en masse*. The RMT's written evidence referred to the fact that equipping workers with the new technology "will require extensive training",[84] and Mick Whelan, General Secretary of ASLEF, told us in detail of the challenges that will arise when this large retraining work takes place.[85]

76. Staff training was one of the issues that dogged the Cambrian line, the small trial of ETCS technology in Wales. Andrew Simmons, chief systems engineer at Network Rail, told us that "a lot of the operational issues were only addressed late" in the Cambrian programme, and that as a lesson learned from the Cambrian line, staff training will be "part of the roll-out programme".[86] Mick Whelan referred to the Cambrian line as an "abject failure" and referred to staff training issues that meant that, among a variety of other issues, the way in which drivers were trained was no longer adequate to safely run the new system.[87] It was made clear that these changes will mean a fundamental change in how drivers are trained. Mick Whelan said "every train driver in the UK […] has been trained on a system that is location based. If you have this signal, it will take you in a certain direction".[88] On an ETCS-enabled network this route-based approached to training may no longer be valid.

77. Both RMT and ASLEF referred to the fragmentation of the rail industry as one reason why a unified ERTMS roll out may falter, and we were told that the RMT do not meet with or engage with the Rail Delivery Group. Using the example of GSM-R deployment, Mick Whelan told us that due to the fragmentation of the network, training in one part of the country can become "unrecognisable to that being delivered in other parts of the country",[89] which weakened delivery of the training packages.

78. All major stakeholders appear to agree that staff need to be considered as an integral part of any rail technology deployment programme, and that to have the programme beset by the same kind of disputes that are currently taking place on Southern Rail and ScotRail, related to Driver Operated Only trains, would be a great detriment to the smooth rollout of new rail technology. David Waboso told us that rail staff were included in the cross-industry nature of the programme, and that part of his experience with Transport for London was "very early in the programme […] bringing staff into it".[90]

79. **Even at this early stage, it is vital that advances in rail technology take into account the impact that changes will have on the workforce. A possible hostile reaction from the workforce or the trade unions should be countered from the outset by a strategy for staff training and development that is as intrinsic to the programme as engineering works.**

84 National Union of Rail, Maritime and Transport Workers (RMT) (RTC0030)
85 Q125 [Mick Whelan]
86 Q36 [Andrew Simmons]
87 Q115 [Mick Whelan]
88 Q125 [Mick Whelan]
89 Q119 [Mick Whelan]
90 Q208 [David Waboso]

Rail operating centres

80. Large control centres capable of controlling larger areas have long been a part of the railway's strategy and are not intrinsically a part of the Digital Railway plan, although the integration of traffic management technology into the signal network will require the transfer to Rail Operating Centres (ROCs) to be completed within the accelerated timeframe of Digital Railway.

81. A number of pieces of written evidence illuminated cultural issues with the transfer of signalling responsibilities to ROCs. Thales told us that delays to ROC consolidation were "more due to associated organisation and cultural challenges than innate technical blockages."[91] The RMT provided some examples of these organisational issues surrounding the transfer of signalling responsibilities to ROCs—for example that there is "a lack of consistent application of the ROC Specification into the design of the operational environment for signallers".[92] These issues were highlighted by an audit by Network Rail at the request of the RMT. While some of the issues may seem minor (for example, that the noise level in the control area at Manchester ROC "seemed excessive") it is important to note that signallers work in an environment where errors could have fatal consequences.

82. **Accelerating the speed with which signalling responsibilities are transferred to Rail Operating Centres (ROCs) presents a challenge to Network Rail. Solving any existing issues with ROCs must come before meeting the timetable of Digital Railway, even if this means other ROC transfers become delayed.**

Timetable planning

83. The timetable planning system is much-maligned, and has come under criticism for not responding to the needs of rail users, particularly freight users. The Department for Transport told us that "with only two scheduled timetabling changes a year, and 40 weeks' notice required for changes, there are significant challenges to optimising timetables to meet the real time demand for both passenger and freight rail".[93] Network Rail claim that introducing traffic management technology will lead to "agile" timetabling that can react to delays in one location, leading to a reduction in secondary and tertiary delays.

84. Tracsis Plc[94] told us that timetable planning is "too approximate", due to timings being rounded to the nearest half minute, locations being generalised into Timing Point Locations, and speeds not being used in the process. We were told that while the current system allocates capacity, it does not revise the plan "to give the best chance of high punctuality".[95]

85. David Waboso described the situation where, with the right technology deployed on the network, a train full of passengers could get priority over another train that was empty. This requires information to be automatically collected that is not currently collected, and is an illustration of where the traffic management technology interacts with other areas covered in Network Railway's Digital Railway programme.

91 Thales UK (RTC0019)
92 National Union of Rail Maritime and Transport Workers (RTC0030)
93 Department for Transport (RTC0001)
94 A rail industry consultancy
95 Tracsis plc (RTC0009)

86. **Advances in traffic management technology can and should be used as an opportunity to overhaul the timetable planning process on the rail network, making it more responsive to the needs of rail operators, to enable them to provide a better service. Overhauling the timetable planning system should therefore be a long-term goal of any traffic management deployment strategy.**

Control periods

87. The bulk of Network Rail's funding is delivered in five year control periods. The current control period, CP5, runs until 2019. A project may be specified as outside the Periodic Review process. One of the conclusions of the Bowe review, with which the Office of Rail and Road (ORR) agreed in written evidence, is that it is less appropriate to use the Periodic Review process "to commit to projects that are (i) at an early stage of development with uncertain specifications and costs, (ii) are very large and would benefit from focused separate programme management disciplines and/or (iii) that require longer-term planning beyond the five-year term of each control period".[96] Projects within the Digital Railway programme may have some or all of these characteristics. The Government will decide which aspects of the programme are considered within or without of the Periodic Review process.

88. Representatives of technology firms expressed concern in the control period structure, and its implications for the industry's confidence that funding would be maintained in the long term. Paul Copeland, Managing Director of Siemens Rail Automation, said "the cyclical nature of the control periods has meant that the signalling industry has suffered in the past from feast and famine, and that has led to an increase in costs, and certainly to losing skilled people from the industry—perhaps to other countries".[97] Similar views were expressed by Nick Crossfield of Alstom[98] and Alistair McPhee of Thales.[99]

89. When these concerns were put to the rail Minister and the Department for Transport, large projects such as HS2 and Crossrail were cited as examples of the Control Period structure not acting as a disincentive for investment. It should be noted, however, that these projects are managed under bespoke arrangements, and it is these arrangements that are recommended in the Bowe review for major infrastructure projects.

90. Brian Etheridge from the Department for Transport said that at this stage in the process the Department was yet to identify what the best roll-out mechanism would be, including whether projects would be included in the Periodic Review process or not;[100] however he did say that there was no reason Control Periods should become a "barrier to good planning".[101] Claire Perry MP, however, alluded to the possibility of the National Infrastructure Commission becoming involved in order to assist "in giving people long-term reassurance".[102]

91. **Technology suppliers and the Rail Delivery Group have cited concerns that the Control Period funding structure has led to a stop-start approach to digital**

96 Office of Rail and Road (RTC0028)
97 Q149 [Paul Copeland]
98 Q151 [Nick Crossfield]
99 Q141 [Alistair McPhee]
100 Q204 [Brian Etheridge]
101 Q239 [Brian Etheridge]
102 Q239 [Claire Perry]

enhancements, stymieing the progress made. The Department should consider carefully whether, in line with the recommendations for large projects in the Bowe review, the Digital Railway (or elements of it) should be placed outside the control period process.

Private funding

92. The Digital Railway programme will be a very large and complex capital investment programme. Various witnesses raised the possibility of private funding being used to progress the programme. Alistair Gordon told us "the capacity benefits will bring huge new revenue from passengers and that can be captured through private investment".[103]

93. Mark Carne appeared open to using the scheme as a vehicle for changing how major projects were funded, as "there will be many investors who have the technology and will be prepared to invest in that technology on our railway, and earn a return based on the incremental capacity that that technology generates", telling us that "that is quite a novel way for us to work, but quite an exciting way".[104]

94. Alistair McPhee gave the example of the arrangement that Thales has with the National Air Traffic System, where some of the performance risk is shared by Thales.[105] This kind of model—where there is performance-based compensation for technology suppliers—is one way in which private firms can share the risk and reward in rail technology deployment.

95. **It is possible that performance-based compensation for traffic management technology providers could improve outcomes by sharing performance risk with technology suppliers. We recommend that this possibility be considered in drawing up contracts for rail traffic management.**

103 Q47 [Alistair Gordon]
104 Q13 [Mark Carne]
105 Q160 [Alistair McPhee]

Conclusions and recommendations

European Train Control System and European Rail Traffic Management System

1. The European Rail Traffic Management System is becoming a global standard. While the UK will presumably no longer be bound by EU Directives when it leaves the European Union, it would be counterproductive and costly not to continue using the same standards as used in the rest of Europe and the wider world. (Paragraph 14)

The Digital Railway Programme

2. We conclude that improvements to signalling and traffic management technology are needed to deliver a world-class rail network in the UK. In principle we support the idea that the deployment of the European Train Control System (ETCS), Traffic Management software and Driver Advisory systems should be accelerated but this should be subject to careful consideration of the Digital Railway business case, clarity about funding, and a clear understanding of how this programme would affect existing plans for work on enhancements and renewals. In particular, Network Rail's Digital Railway business case should include a full cost/benefit analysis of all potential systems for a particular route, and consult upon it, before finalising its Digital Railway strategy. (Paragraph 29)

Network Rail

3. Network Rail's recent history of planning major enhancements work is poor. In producing a plan for the deployment of rail technology, it must be mindful of the consequences and impact of further failures. (Paragraph 34)

ETCS cab fitment fund

4. Cuts to the cab fitment fund may delay the procurement of first-in-class fitment for all rolling stock. Given these cuts, the business plan for Digital Rail should make clear how first-in-class design and cab fitment will be funded. The Department should track how quickly cab fitment is progressing, how changes in funding affect the rate of cab fitment and what implications the rate of progress has for realising the promised increase in capacity. (Paragraph 38)

5. *We recommend that the Department for Transport take steps to ensure that work on cab fitment and trackside infrastructure remain broadly aligned; it would be disappointing if trackside infrastructure was ready but could not be used because cab fitment had not progressed quickly enough or vice versa.* (Paragraph 39)

Supplier confidence

6. The Digital Railway business plan is an opportunity to regain eroded industry confidence. Network Rail must be mindful of the damage that will be done to supplier confidence if another technology procurement is started only to be halted

or abandoned. When planning the Digital Railway programme the Department and Network Rail should consider carefully the risks arising from any further erosion of supplier confidence. (Paragraph 43)

7. The Digital Railway programme cannot be delivered without a cross-industry approach. Technology suppliers are clearly fundamental to a modern rail network. We recommend that Network Rail address the concerns expressed in the evidence we have taken that suppliers and the rail technology industry have not been sufficiently involved. Network Rail and the Department for Transport should take steps to ensure that the views of suppliers and the rail technology industry are heard in consultations on the potential, scope, and cost of projects. It is important that work on the Digital Railway is co-ordinated and is underpinned by a whole sector approach. (Paragraph 45)

Claims of increased capacity

8. Over ambitious claims for improvements in capacity must be met with scepticism, and Network Rail should be very cautious about how it uses the 40% claim. *The Department should be very clear about the level of capacity improvement likely to be achieved when assessing the business case for the Digital Railway. It should consider alternative ways of achieving the same level of growth in capacity so that it can make an informed decision on the likely cost/benefit ratios and funding for the Digital Railway. Rather than claims of up to 40% we expect to see a more sophisticated assessment of the likely capacity gains that look at different investment scenarios and their associated costs, benefits and risks. It is important that the Department for Transport and Network Rail make a realistic assessment of how much extra capacity each system within the Digital Railway programme can deliver to meet growing demand. Where the Digital Railway offers the best solution it is important that other work, such as that needed to improve station capacity, is done simultaneously to enable the investment in the Digital Railway to deliver its full potential.* (Paragraph 49)

9. Projections based on ETCS Level 3 should only be considered valid when the Level 3 specification is ready for deployment, and Network Rail should avoid using such projections, or the promise of a "moving block" signalling system, in its publicity until such technology is ready to be deployed. (Paragraph 51)

Delays to ETCS and Traffic Management roll out

10. It is important that projects are flexible, and re-signalling works should not be held to an artificial timetable when a delay is required for legitimate reasons. Nonetheless, we have some concern that the recent announcements of delays in both the Romford ROC and the Norwich–Yarmouth–Lowestoft line may be early indications that the timetable that Network Rail has set for Digital Railway is over-ambitious and will not be met. We look to Network Rail to be realistic and measured in the time frame that it sets in the business case for Digital Railway, even if this means rowing back from the 2029 target. (Paragraph 56)

11. The appointment of David Waboso to head Digital Railway is an encouraging sign that signalling expertise will be used to inform the Digital Railway programme. (Paragraph 60)

Making choices

12. Network Rail is right not to present the Digital Railway proposal as a plan to fit ETCS Level 2 across the network; it might not be the appropriate intervention for every line. We recommend that Network Rail keep an open mind in its strategy, pick the most effective intervention for each route, and look to press ahead with Connect Driver Advisory systems and Traffic Management solutions where these are cost-effective. (Paragraph 68)

13. While there is no reason to keep all re-signalling work on hold while waiting for ETCS Level 3, we support the continued development of that system and request that Network Rail undertake a full cost/benefit system of introducing that system directly as opposed to evolving to it from a Level 2 system. As part of that analysis, we recommend that any assessment of a Level 2 system should require input from potential suppliers on the feasibility and costs of upgrading to Level 3. (Paragraph 71)

Passenger and freight rail

14. The rail freight industry must not be forgotten in the deployment of signalling and traffic management technology, either by the failure to be accounted for in Network Rail's plans, or by a lack of will on the part of the industry to invest in new technology. The Department and Network Rail should continue to have discussions with the Rail Freight Group to discover ways in which ETCS cab fitment in freight can be accelerated in line with passenger rail. We welcome the Government's commitment to do this in the recently published Rail Freight Strategy. (Paragraph 74)

Rail staff and the Digital Railway

15. Even at this early stage, it is vital that advances in rail technology take into account the impact that changes will have on the workforce. A possible hostile reaction from the workforce or the trade unions should be countered from the outset by a strategy for staff training and development that is as intrinsic to the programme as engineering works. (Paragraph 79)

Rail operating centres

16. Accelerating the speed with which signalling responsibilities are transferred to Rail Operating Centres (ROCs) presents a challenge to Network Rail. Solving any existing issues with ROCs must come before meeting the timetable of Digital Railway, even if this means other ROC transfers become delayed. (Paragraph 82)

Timetable planning

17. Advances in traffic management technology can and should be used as an opportunity to overhaul the timetable planning process on the rail network, making it more responsive to the needs of rail operators, to enable them to provide a better service. Overhauling the timetable planning system should therefore be a long-term goal of any traffic management deployment strategy. (Paragraph 86)

Control periods

18. Technology suppliers and the Rail Delivery Group have cited concerns that the Control Period funding structure has led to a stop-start approach to digital enhancements, stymieing the progress made. The Department should consider carefully whether, in line with the recommendations for large projects in the Bowe review, the Digital Railway (or elements of it) should be placed outside the control period process. (Paragraph 91)

Private funding

19. It is possible that performance-based compensation for traffic management technology providers could improve outcomes by sharing performance risk with technology suppliers. We recommend that this possibility be considered in drawing up contracts for rail traffic management. (Paragraph 95)

Glossary of terms and acronyms

ATO	Automatic train operation
C-DAS	Connected driver advisory system (See also DAS)
CP5	A five year planning period—Control period 5 2014–19
CP6	A five year planning period—Control period 6 2019–2024
DAS	Driver advisory system (see also C-DAS)
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
First-in-class cab fitment	Network Rail funds the development of a design for on-board ETCS technologies for each class of locomotive or trainset (including sub class variants)
Fixed block signalling	Signals mounted by the side of the track divide the line into 'blocks' and only one train is allowed into each block at any time
GSM-R	Global System for Mobile Communications–Railway or GSM-Railway
Headway	The time between two trains passing the same location on a railway line at a specified speed, effectively the 'gap' that must be maintained between trains in order that the following train can stop safely if the first train is stopped for any reason
Moving block signalling	A system in which signalling 'blocks' are defined by a radio block centre or rail operating centre rather than by fixed points on the track. Trains report their location to an RBC, which calculates the safe movement limit of each train in real time
ORR	Office of Rail and Road
PR13	ORR's 2013 periodic review (PR13) of Network Rail's outputs and funding for control period 5 (2014–19)
RBC	Radio block centre
RDG	Rail Delivery Group
ROC	Rail operating centre
ROSCO	Rolling stock operating company
RSSB	Rail Safety and Strategy Board
TMS	Traffic management system
TOC	Train operating company
UNIFE	A trade body representing the European rail manufacturing industry
UNISIG	An industrial consortium created to develop the ERTMS/ETCS technical specifications

A fuller description of moving block signalling and ETCS can be found in the POSTbrief on Moving Block Signalling published by the Parliamentary Office of Science and Technology.[106]

106 Parliamentary Office of Science and Technology, Moving Block Signalling, April 2016

Formal Minutes

Monday 17 October 2016

Members present:

Mrs Louise Ellman, in the Chair

Robert Flello	Huw Merriman
Mary Glindon	Will Quince
Karl McCartney	Iain Stewart
Stuart Malcolm McDonald	Graham Stringer
Mark Menzies	Martin Vickers

Draft Report (*Rail technology: signalling and traffic management*), proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 95 read and agreed to.

Summary agreed to.

Resolved, That the Report be the Seventh Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

[Adjourned till Monday 24 October at 4.00pm

Witnesses

The following witnesses gave evidence. Transcripts can be viewed on the inquiry publications page of the Committee's website.

Monday 23 May 2016	*Question number*
Mark Carne, Chief Executive, Network Rail, **Andrew Simmons**, Chief Systems Engineer, Digital Railway Programme, Network Rail, and **Alistair Gordon**, Technology and Operations, Rail Delivery Group	Q1–48

Monday 13 June 2016	
Roger Cobbe, Policy Director, Arriva, **Richard Pierce**, Engineering Development Director, Arriva, and **Christian Roth**, Managing Director, South West Trains	Q49–91
Nigel Jones, Rail Freight Group	Q92–111
Mick Whelan, General Secretary, ASLEF, and **Mick Cash**, General Secretary, RMT	Q112–Q132

Monday 4 July 2016	
Alistair McPhee, Vice President, Ground Transportation Systems, Thales, **Paul Copeland**, Managing Director, Siemens Rail Automation, and **Nick Crossfield**, UK&I Managing Director, Alstom	Q133–165
Andy Course, Chief Operating Officer, Eversholt Rail, **Malcolm Brown**, Chief Executive, Angel Trains, and **Tim Gilbert**, Engineering Director, Porterbrook Leasing	Q166–184

Monday 11 July 2016	
David Waboso, Managing Director, Digital Railway, Network Rail, **Claire Perry MP**, Parliamentary Under-Secretary of State, Department for Transport, and **Brian Etheridge CBE**, Director of Network Services, Rail, Department for Transport	Q185–239

Published written evidence

The following written evidence was received and can be viewed on the inquiry publications page of the Committee's website.

RTC numbers are generated by the evidence processing system and so may not be complete.

1 Alstom UK&I (RTC0020)

2 Angel Trains, Eversholt Rail Group and Porterbrook Leasing (RTC0008)

3 Arriva (RTC0021)

4 ASLEF (RTC0011)

5 Department for Transport (RTC0001)

6 Dr Alan Cribbens (RTC0003)

7 Great Western Railway (RTC0031)

8 Hitachi Rail Europe (RTC0024)

9 IRSE (RTC0004)

10 Keolis UK (RTC0016)

11 Mr Roger Ford (RTC0002)

12 National Union of Rail Maritime and Transport Workers (RTC0030)

13 Network Rail (RTC0012)

14 Office of Rail and Road (RTC0028)

15 Passenger Transport Networks (RTC0014)

16 Prover Technology (RTC0029)

17 Rail Delivery Group (RTC0006)

18 Royal Academy of Engineering (RTC0027)

19 RSSB (RTC0007)

20 RVEL (RTC0018)

21 Sanjeev Appicharla (RTC0010)

22 Sanjeev Appicharla (RTC0023)

23 Sanjeev Appicharla (RTC0026)

24 Siemens Rail Automation (RTC0005)

25 SmarterUK (RTC0013)

26 Thales (RTC0019)

27 Tracsis plc (RTC0009)

28 Transport for London (RTC0022)

List of Reports from the Committee during the current Parliament

All publications from the Committee are available on the publications page of the Committee's website.

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2015–16

First Report	Surface transport to airports	HC 516 (HC 995)
Second Report	Road traffic law enforcement	HC 518 (HC 132)
Third Report	Airport expansion in the South East	HC 784 (HC 564)
First Special Report	Investing in the railway: Network Rail Response to the Committee's Seventh Report of Session 2014–15	HC 347
Second Special Report	Motoring of the future: Government Response to the Committee's Eighth Report of Session 2014–15	HC 349
Third Special Report	Smaller airports: Government Response to the Committee's Ninth Report of Session 2014–15	HC 350
Fourth Special Report	Strategic river crossings: Government Response to the Committee's Tenth Report of Session 2014–15	HC 348
Fifth Special Report	Strategic river crossings: Greater London Authority Response to the Committee's Tenth Report of Session 2014–15	HC 558
Sixth Special Report	Surface transport to airports: Government Response to the Committee's First Report of Session 2015–16	HC 995

Session 2016–17

First Report	Operation Stack	HC 65 (HC 602)
Second Report	All lane running	HC 63 (HC 654)
Third Report	Volkswagen emissions scandal and vehicle type approval	HC 69 (HC 699)
Fourth Report	Skills and workforce planning in the road haulage sector	HC 68 (HC 740)
Fifth Report	All lane running: Government response	HC 654
Sixth Report	The future of rail: Improving the rail passenger experience	HC 64

First Special Report	Road traffic law enforcement: Government Response to the Committee's Second Report of Session 2015–16	HC 132 (HC 518)
Second Special Report	Airport expansion in the South East: Government response to the Committee's Third Report of Session 2015–16	HC 564
Third Special Report	Operation Stack: Government response to the Committee's First Report of Session 2016–17	HC 602
Fourth Special Report	Volkswagen emissions scandal and vehicle type approval: Government response to the Committee's Third Report of Session 2016–17	HC 699
Fifth Special Report	Skills and workforce planning in the road haulage sector: Government response to the Committee's Fourth Report of Session 2016–17	HC 740