NetworkRail

Digital Railway Programme

Strategic Plan

March 2019

Contents

Note:

The business is currently in the midst of a strategic review (100-day plan). The outcomes of which may ultimately impact some elements of the Business Plan. Presently, there is a level of uncertainty around the outcomes of the review and the likely implementation of them. Therefore this Strategic Plan is not based on any 100-day plan outcomes. However, on the completion of the review and the associated action plans, any outcomes that will impact on the overall business plan will be reflected through the change control mechanism.

This Strategic Plan, developed in preparation for Control Period 6, becomes our Delivery Plan as we go through CP6. So the term Delivery Plan is used from here on.

1. Purpose, role & vision

The Digital Railway Programme vision articulates the outcome that implementing digital railway systems means for the UK rail industry, users, and the wider society.

The purpose sets out the outputs that the Digital Railway Programme will deliver.

The role defines what and how the Digital Railway Programme will deliver the outputs and enable the rail industry to realise Digital Railway Strategy outcomes.

1.1. Vision

The DfT set out its strategic vision within "Connecting People: a strategic vision for rail" (2018) which stated:

"The use of digital technology is a huge opportunity for rail. These technologies will help the railway of the future make better use of the existing infrastructure and capacity to reduce the need for costly and disruptive civil engineering schemes, and find much more sustainable solutions which are lower cost for rail users and taxpayers. Investing in Digital Railway could also create high-value jobs, help rebalance the economy and promote the establishment of a world class industry capable of exporting globally."

Building on this a jointly signed DfT and Industry 'Digital Railway Strategy' (2018)[1] was created which focused on addressing four key challenges namely:

1. Safety - for the public, passengers and industry staff;
2. Sustainability - lower industry whole life cost;
3. Performance – reducing primary and secondary delays and their impacts on customers; and
4. Capacity – improving capacity to reduce crowding and enable growth.

Within the Digital Railway Strategy the DR Programme's purpose is stated as:

"The Digital Railway Programme is a benefits-driven, cross-industry change programme enabled by technology, which will facilitate the delivery of systems, technology, business and people change in an integrated way."

The Digital Railway Strategy lists some of the many digital systems that could be introduced but also recognises that a 'targeted' approach is required to make an effective and efficient change to the industry. It also recognises that some of the digital systems have a far greater impact across the rail industry than others and so the need for a programme to facilitate those changes for those systems is far greater. As a consequence, as we enter CP6, the targeted digital technologies are:

- European Train Control Systems (ETCS), which is expected to deliver greater sustainability through lower industry whole life cost, as well as capacity, performance and safety benefits; and
- Traffic Management (TM), including its interface to C-DAS, which is expected to reduce delays.

In addition to targeting the technologies CP6 will also see an increased focus on the key schemes that the emerging business cases suggest will deliver the greatest benefit.

[1] Digital Railway Strategy (Network Rail) 20 May 2018

During CP6, the DR Programme will continue to review ongoing deployments for lessons learnt and benefits realisation and prepare for deployments beyond CP6.

The changing focus of the DR Programme from CP5 to CP6 reflects the transition from a period of general advocacy for digital railway systems, early deployments, initial lessons learnt and early business case development towards a more deployment focussed phase. CP6 will build on that experience to support the routes with the next deployments of ETCS and TM. Whilst recognising that it is still some distance away this will be undertaken in the context of moving towards 'business as usual' and form the next step of that transition.

As we enter CP6 the vision for the DR Programme is therefore to support NR's Routes and Industry to;

Realise the benefits of ETCS and TM deployments for rail users and the wider economy such that they become the default signalling and control systems and leave a legacy of knowledge to ensure safe, effective and efficient future deployments.

Network Rail, the government, and industry partners are committed to delivering the digital railway vision. As part of a 'sector deal', published in December 2018, the rail industry is developing plans to enable digital train control and traffic management systems to be rolled out at lower cost than conventional signalling by 2025.

The DR Programme is following this vision to enable the delivery of targeted capacity, performance and safety benefits from new technology and operational process deployments. Benefits of the technology set out in business case analyses are shown in Table 1 below.

Table 1: DR Programme benefits summary

		Enhanced safety for passengers and workforce	Increased capacity to meet demand	Better performance for passengers and freight customer journeys	Enabling faster journey times	Less disruption from renewals, maintenance and upgrade	Better asset sustainability (lower whole life cost)	Enabling data connectivity for passenger and freight customers, as well as assets
People	Industry skills, capability and business change	Enabled by people, skills, capability and business change						
Technology	Safe separation of trains – ETCS (European Train Control System)	✓	✓	✓	✓	✓	✓	
	Traffic Management	✓		✓		✓		✓
	Train Movement Control: Connected Driver Advisory System (C-DAS) & Automatic Train Operation (ATO)	✓	✓	✓	✓			
	Telecoms and Data	Enabled by telecoms and Data						✓

1.2. Purpose

In the context of the vision, the purpose of the DR Programme is to support Industry, the Routes and NR's central functions to safely, effectively and efficiently deploy ETCS and TM systems to realise the benefits as swiftly as practical.

The introduction of ETCS and TM systems has been recognised as a change programme because they impact multiple parts of the industry and generally there is little existing knowledge of the technologies and how to introduce, operate and maintain them. Therefore, from a Route perspective the change impact is far greater than a conventional change and the primary purpose of the DR Programme is to support the Routes with the changes and through the Routes the wider industry. To achieve this, the DR Programme must provide:

- Capability - the knowledge of the systems and how to implement, operate and maintain them; and
- Capacity – additional resource to undertake the workload to implement the systems.

1.3. Role

The DR Programme will provide this capability and capacity in two basic ways:

- There will be a set of outputs that are generic documents such as strategies, plans or requirements and are deliverables of the DR Programme; and
- The capability and capacity will be packaged into services for the routes as they wish to remit that may include, as examples, strategic, technical, commercial/financial, operations, maintenance and assurance support.

Additionally, the DR Programme will oversee delivery of enablers which are more substantial, tangible outputs such as upgrading the telecoms network or provision of test facilities that will be required whichever Route deploys the systems.

The details of the outputs, services and enablers provided by the Final Determination funding are provided within this Delivery Plan.

2. Objectives & Stakeholder Priorities

2.1. Stakeholders & priorities

Key stakeholder groups for the DR Programme are illustrated in Figure 1.

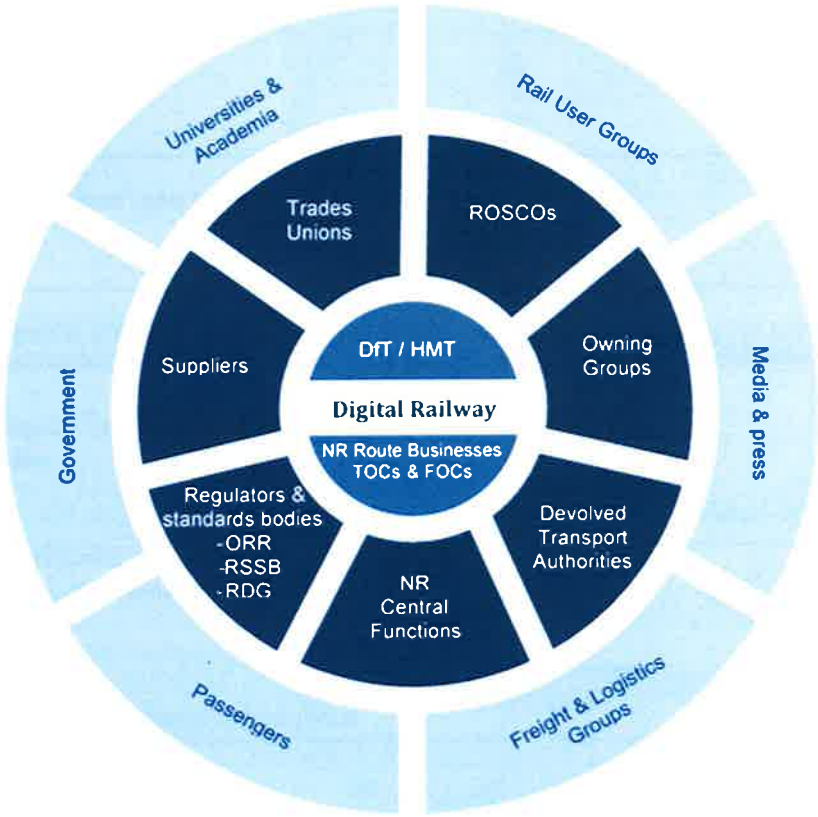


Figure 1: Stakeholders in the DR Programme

The DR Programme has an active and ongoing engagement with its stakeholders as described in section 2.1.1 and through the industry governance framework for DR set out in section 3.2.4. The stakeholder engagement seeks both to shape the direction, share in the development and agree the detail of the DR Programme's activities. Through that engagement and with reference to published documents, stakeholder priorities have been developed and identified that DR Systems can help address, as shown in Table 2 below.

Table 2: Key Stakeholder Groups and their leading priorities that DR Systems can help address

Key Stakeholders Groups	Their Leading Priorities
Passengers[2]	• Value for money • Punctual and reliable train services • Minimise crowding • Delays dealt with well
Freight customers[3]	• Place freight customers at the heart of the industry, alongside passengers • Encourage and deliver rail freight growth • Maintain a national network for freight • Give fair and equal access for all freight services • Ensure that new and existing freight services can be delivered efficiently • Enable continued private and public sector investment for freight
Government and Regions[4, 5, 6]	• Maintained focus on safety • Better journeys for passengers and freight • Value for money to the tax payer and fare payer • Reasonable, affordable and deliverable operations, maintenance and renewal of the rail network • Increased inclusive economic growth • The DR Programme, together with its deployment and procurement strategies, are key to the successful development of the 2018 Rail Sector Deal[7], which furthers the 2017 Building our Industrial Strategy[8] which the rail industry has put forward to Government
Office of Rail and Road (ORR)	• A safer railway • Better customer service • Improved efficiency and value for money for taxpayers, fare payers and funders • A dynamic and commercially sustainable rail sector

[2] National Rail Passenger Survey Spring 2018 (Transport Focus) 19 June 2018
[3] Position Paper: Rail Freight Outcomes in Rail Review (Rail Freight Group) 22 November 2018
[4] Railways Act 2005 Statement High Level Output Specification (DfT) 20 July 2017
[5] The Scottish Ministers' High Level Output Specification for Control Period 6 (Transport Scotland) 20 July 2017
[6] Secretary of State for Transport's speech May 2018
[7] Rail Sector Deal (Department for Business Energy and Industrial Strategy) 6 December 2018
[8] Building our Industrial Strategy (Dept for BEIS) 23 January 2017

Key Stakeholders Groups	Their Leading Priorities
Route Businesses (Network Rail)[9]	• Asset sustainability - need to find lower whole-life solutions to network-wide renewal needs • Improved long term train performance • Increased capacity to meet current and future demand growth • Capitalising on opportunities to reduce cost and disruption to Routes and their customers through alignment with franchise, rolling stock and asset renewals • A safer railway for users, workers, neighbours and the public
Rail Delivery Group (RDG), Operators and their Owning Groups[10, 11]	• Quality and equality of service (including improved safety and network capability) • Efficient costs • Simplification • Stable, consistent and nationally co-ordinated rollout of digital technologies (including integrated systems) • Promotion of alignment of incentives • Open and transparent decision making with industry partners before implementation
Supply Chain[12]	• Clarity and stability of outcomes/timescales to create the market conditions for growth • Accelerate the uptake of innovation • Developing people and skills in order to address future skills shortages and to increase productivity • Grow exports and inward investment to unlock new opportunities at home and overseas and grow UK manufacturing • The DR Programme, together with its deployment and procurement strategies, are key to the successful development of the 2018 Rail Sector Deal[13], which furthers the 2017 Building our Industrial Strategy[14] which the rail industry has put forward to Government
System Operator (Network Rail)	• Effective integration of digital railway solutions in the industry Long Term Planning Process, to support proactive consideration of technology as an option to enhance capacity and to inform decision making by funders • Holistic engagement of the DR Programme in the franchise competition process, to enable better alignment and better outcomes for funders, operators and passengers • Supporting the DR Programme through investment in timetabling tools and technology to enable the realisation of digital railway capacity benefits in the timetable.

[9] Routes' SOBC problem and opportunity statements (NR) 2017-2018
[10] Memorandum of Understanding (RDG and NR) 15 November 2016
[11] RDG presentation to DR Programme away day 2 October 2018
[12] Fast Track to the Future – A strategy for productivity and growth in the UK rail supply chain (Rail Supply Group) February 2016
[13] Rail Sector Deal (Department for Business Energy and Industrial Strategy) 6 December 2018
[14] Building our Industrial Strategy (Dept for BEIS) 23 January 2017

Key Stakeholders Groups	Their Leading Priorities
Safety, Technical and Engineering (Network Rail)	• Current priority is DR Programme input to the Rail Technical Strategy on industry readiness levels and delivery of agreed capability levels for control, command and signalling assets • The specification for future communications and train control is owned by the Chief Signalling Engineer • Setting requirements for technical solutions for track worker safety.
Trades Unions[15]	• Adherence to agreed national principles • An agreed national framework within which consultation and /or negotiation for the introduction of new technologies is conducted • Clear understanding of impact on their members in respect of roles and competencies • A clear competency development and training strategy and corresponding plans
ROSCOs[16]	• Clear specifications for ETCS fitment on train fleets • A robust and clear framework for testing and validation of the ETCS equipment to be fitted to train fleet • Clarity and stability of outcomes/timescales to create the market conditions for growth • A stable plan for the roll out of ETCS to facilitate timely, effective and efficient vehicle fitment

[15] Sourced through the engagement described in section 2.1.1.2
[16] Multi-party contract between Network Rail and ROSCOs 2015

2.1.1. Engagement Activities

The DR Programme's priorities arise from the challenges and needs identified in the rail industry's Long-Term Planning Process and, in particular, Route Studies developed as part of that process through extensive stakeholder engagement.

2.1.1.1. Industry

Industry stakeholders including RDG, passenger and freight operators (TOCs and FOCs), Rolling Stock Companies, ORR, RSSB, Transport Scotland and DfT are represented on Digital Railway's Programme Board (the key DR Programme decision making body) and the functional boards below: Integrated Plan Review Group, Strategy, Franchising and Sponsorship Board and Systems and Operations Board, reflecting that DR Programme is an industry programme. See section 3.2.5 below for more detail about these boards.

As devolution becomes more embedded into Network Rail, the Routes have adapted their meeting structure to incorporate the DR Programme as required for their route. Route Steering Boards have been established for strategic decision making where Routes require them to support identified programmes of work looking at potential digital upgrades for CP6, 7 and beyond. These meetings bring together a range of stakeholders, including train operators, the DfT and senior planners to review technical outputs of the DR Programme as appropriate. Further Route Steering Boards may be established to meet future demand to look at digital railway deployments. Membership may include:

- Route Managing Directors, Network Rail;
- Route Asset System and Integration Managers, Network Rail;
- Directors of Route Asset Management, Network Rail;
- Strategic Planners, Network Rail;
- DfT;
- Passenger and freight train operating company representatives;
- Rail Delivery Group;
- DR Programme technical Specialists.

Route Steering Boards review studies and business cases with a view to endorsing their development process, options and assumptions prior to submission for review by the DfT, where appropriate.

During CP6, the DR Programme will seek to support Routes in developing their approaches to DR system implementation to meet their (and their customers') needs, through discussions with operations, maintenance, system operator, asset management and change management teams. In some Routes this is already taking place including:

- Providing independent advice to Routes relating to current operating systems from an operations, maintenance and engineering perspective to help Routes develop improvement strategies
- Working with TOC, FOC and other industry groups such as RDG and RIA in the development of cross-industry solutions
- Helping define the scope of DR technologies and deployments
- Defining and developing the business case for DR technologies
- Capturing data relating to the performance of the system
- Helping to define a commercial relationship with current and potential suppliers by working on the deployment of DR technology in line with the UK specifications and customer requirements.

2.1.1.2. Trades Unions

The DR Programme has maintained positive and proactive engagement with Trades Unions. Since establishment of the 'Joint Working Groups' (Operations and Maintenance) in 2016, involving TSSA, RMT and Unite, the groups have been meeting and discussing aspects of the programme on a regular basis. This arrangement has stimulated and helped to foster a spirit of close and collaborative working between the parties to the extent that they have developed and are now in the final stages of obtaining agreement on two separate national framework agreements covering the deployment of Digital Railway systems.

Engagement with ASLEF, The train drivers' union, continues to be led by train and freight operating companies, with support from the Rail Delivery Group. These meetings are held on a similarly regular basis and have led to an upcoming ERTMS position paper which is expected to reaffirm their support for the technology.

Reinforcing this working level engagement, the DR Programme has, in addition to this, recently embarked on a programme of less frequent but high-level briefings to Trades Union Executives (the General Secretaries of all Trades Unions) which has been welcomed and very well received.

2.2. Specific objectives

The stakeholder priorities of section 2.1, together with the Digital Railway Strategy have shaped the DR Programme's objectives for CP6. As set out in section 1 this is focused on targeted deployments of ETCS and TM and their enablers to focus resources towards achieving tangible results. The aim is to build momentum, learn lessons in a controlled manner, ensure the benefits are realised and move the systems towards being the default signalling and control systems. This is clearly a longer term aspiration. Therefore, at the beginning of CP6, it is recognised that the immediate objectives to bring about that change will not in themselves necessarily satisfy the stakeholder priorities directly; rather they will enable their future realisation.

Section 1.3 explained the DR Programme would provide its capability and capacity through outputs and serivces in support of route deployments. Additionally some enablers to support the introduction of ETCS and TM will also be provided. These outputs, services and enablers, that are funded through the Strategic Business Plan, are set out in the following sections.

2.2.1. Outputs

The outputs of the DR Programme funded through the Final Determination in CP6 are as follows.

- A long term renewals baseline to guide the deployment of ETCS from CP7 onwards.
- Capture and document lessons learnt from a wide range of relevant sources including the ongoing deployments.
- Template documentation to support business change within the Routes and operators.
- Requirements for safe, effective and consistent operation and maintenance of ETCS and TM.
- Identification of the test and validation facilties required for a safe, effecive and efficient introduction of ETCs and TM and any systems and processes to support that.
- Development of training materials ranging from analysis of all roles and how they are impacted and then, for selected roles, develop complete training packages ready for delivery.
- Identification of industry standards, processes and procedures required or impacted by the introduction of ETCS and TM.
- Proposed new or amended industry standards,

processes and procedures where required by the introduction of ETCS and TM and promote their adoption through the appropriate mechanisms.
- Recognition that the DR Programme is a change programme with a finite life, through development of a disposition statement to propose how the functions of the programme would be devolved within Network Rail and the wider industry to move towards 'business as usual'.

2.2.2. Services

The services of the DR Programme funded through the Final Determination in CP6 are as follows.

- Support for feasibility studies and business business case development.
- Support to access and draw down funding sources to develop and/or deliver ETCS and TM deployments, for example, from the National Productivity Investment Fund.
- Coordination and alignment of the many activites required to impment ETCS and TM.
- Where not directly in control, advise relevant of parties of missing or delayed activities that may impact a deployment scheme.
- Support busines change within the routes.
- Propagate the lessons learnt to relevant parties.
- Support commercial and procurement activities for the deployment of ETCS and TM.
- Support the transition of TM deployments to route ownership,
- Benefits management and realisation.

2.2.3. Enablers

The enablers of the DR Programme funded through the Final Determination in CP6 are as follows.

- Upgrade the existing core telecoms network to provide General Packet Radio Service (GPRS) over the GSM-R and Fixed Telecoms Network to support the forecast demands of ETCS.
- Provide an On Line Key Management System to manage crytographic keys to provide secure communication between the ETCS onboard and track side sub systems.
- Provide the test and validation facilities identified as required for a safe, effecive and efficient introduction of ETCS and TM such that there is confidence that day one performance is acceptable.
- Provide any systems and processes necessary to support the safe and efficient introduction of ETCS and TM such that performance improves from day one introduction in line with the plan.

2.2.4. Monitoring

The progress of the DR Programme towards achieving its objectives will be monitored through Network Rail's internal business processes. With industry stakeholders it will be monitored through the processes described in section 2.1.1.

Additionally, the DR Programme, being part of the wider Group Digital Railway, contributes to the Group Digital Railway scorecard shown in Table 3 for:

- GDR milestone delivery;
- Cash compliance; and
- Safety.

Table 3: Group Digital Railway scorecard

GDR Long-term scorecard

Safety			19/20	20/21	21/22	22/23	23/24	24/25	25/26
LTIFR	WORSE THAN TARGET		0.332	0.284	0.243	0.209	0.179	0.161	0.145
	TARGET		0.316	0.271	0.232	0.199	0.170	0.153	0.138
	BETTER THAN TARGET		0.300	0.257	0.220	0.189	0.162	0.145	0.131
% Close calls closed in 90 days	WORSE THAN TARGET		76.64	76.77	76.90	77.03	77.16	77.29	77.42
	TARGET		85.15	85.30	85.45	85.59	85.74	85.88	86.02
	BETTER THAN TARGET		93.67	93.83	93.99	94.15	94.31	94.47	94.62
Train Performance			19/20	20/21	21/22	22/23	23/24	24/25	25/26
Delay Minutes	WORSE THAN TARGET		114,126	110,932	108,375	107,122	105,953	104,798	103,656
	TARGET		103,751	100,847	98,523	97,384	96,321	95,271	94,233
	BETTER THAN TARGET		93,376	90,762	88,671	87,646	86,689	85,744	84,809
Locally Driven Measures			19/20	20/21	21/22	22/23	23/24	24/25	25/26
Service Availability	WORSE THAN TARGET		90%	90%	90%	90%	90%	90%	90%
	TARGET		94%	94%	94%	94%	94%	94%	94%
	BETTER THAN TARGET		96%	96%	96%	96%	96%	96%	96%
Your Voice Total score	WORSE THAN TARGET		45%	46%	47%	48%	49%	50%	51%
	TARGET		50%	51%	52%	53%	54%	55%	56%
	BETTER THAN TARGET		60%	61%	62%	63%	64%	65%	66%
Local Your Voice Action Plans Completed	WORSE THAN TARGET		80%	80%	80%	80%	80%	80%	80%
	TARGET		90%	90%	90%	90%	90%	90%	90%
	BETTER THAN TARGET		100%	100%	100%	100%	100%	100%	100%

Table 4: Group Digital Railway scorecard continued

Investment			19/20	20/21	21/22	22/23	23/24	24/25	25/26
Strategic Transformation Milestones	WORSE THAN TARGET		80%	80%	80%	80%	80%	80%	80%
	TARGET		90%	90%	90%	90%	90%	90%	90%
	BETTER THAN TARGET		100%	100%	100%	100%	100%	100%	100%
Level 1 Milestones	WORSE THAN TARGET		80%	80%	80%	80%	80%	80%	80%
	TARGET		90%	90%	90%	90%	90%	90%	90%
	BETTER THAN TARGET		100%	100%	100%	100%	100%	100%	100%
Asset Management			**19/20**	**20/21**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**
Telecoms service affecting failures	WORSE THAN TARGET		2,605	2,521	2,450	2,395	2,361	2,335	2,309
	TARGET		2,368	2,292	2,227	2,177	2,146	2,123	2,099
	BETTER THAN TARGET		2,131	2,063	2,004	1,959	1,931	1,910	1,890
Renewal Volumes	WORSE THAN TARGET		3,338	6,377	13,467	10,451	6,116	16,886	6,703
	TARGET		3,709	7,086	14,963	11,612	6,795	18,762	7,448
	BETTER THAN TARGET		4,080	7,795	16,459	12,773	7,475	20,638	8,193
Financial Performance			**19/20**	**20/21**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**
Financial Performance Measure – gross excl. enhancements (£m)	WORSE THAN TARGET		-£15m	-£18m	-£20m	-£19m	-£17m	TBC	TBC
	TARGET		£0m	£0m	£0m	£0m	£0m	TBC	TBC
	BETTER THAN TARGET		£15m	£18m	£20m	£19m	£17m	TBC	TBC
Cash compliance (Lost Funding) income & expenditure	WORSE THAN TARGET		6%-10%	6%-10%	6%-10%	6%-10%	6%-10%	6%-10%	6%-10%
	TARGET		1%- 5%	1%- 5%	1%- 5%	1%- 5%	1%- 5%	1%- 5%	1%- 5%
	BETTER THAN TARGET		=<1%	=<1%	=<1%	=<1%	=<1%	=<1%	=<1%

3. What is the Digital Railway Programme

3.1. Structure

The DR Programme reports via the Managing Director, Group Digital Railway to Network Rail's Chief Executive and works closely with the devolved Routes, the System Operator and the Safety, Technical and Engineering functions in Network Rail.

The programme supports and co-ordinates digital technology deployments for Routes and their customer TOCs and FOCs, acting as expert adviser on upgrading GB railway for digital train control and signalling systems, based on lessons learned from completed and active deployments.

The programme is structured on the basis of providing expertise and coordination to devolved Routes and to develop an outcome-focused digital railway supply chain.

The programme is operating three central elements:

- **Core Programme Management and Support Activities** – This incorporates the Programme Director's team, the Programme Management Office (PMO), the Commercial and Financial functions, and the DR System Authority;
- **Strategy, Franchising and Sponsorship** – analysing the issues that the railway currently faces, what capabilities the programme could deploy to remedy the issues, and developing business cases to justify the cost of change; all in conjunction with the Routes and broader industry;
- **Digital Initiation Directorate** – responsible for enabling the digital railway across the network with a focus on Systems, Business Change and Traffic Management Deployment.

These work closely with each other and with partners across the rail industry to plan, develop and deliver digital technologies onto the rail network. The costs for the DR Programme in CP6 are in Section 5.

3.1.1. Core Programme Management and Support Activities

The core programme activities are the foundation for the management and delivery of the DR Programme and achievement of its goals.

The Programme Director's team and its support functions coordinate work across the programme, are responsible for the planning and operation of the programme, and provide management direction and engagement. They have a key role in managing the DR Programme's route through CP6 which finishes with all DR Programme activities complete or transitioned to business-as-usual and the DR Programme itself being closed down.

The Programme Management Office manages the DR Programme plan, risks, interdependencies and interfaces by driving economies and efficiencies in the execution of the programme. It defines a consistent approach across the DR Programme.

The Commercial team provides support both to the DR Programme itself and to partners in the identification, procurement and management of commercial structures

and contracts required to deliver the DR Programme's objectives and enable its related projects.

The DR System Authority ensures the technologies and configurations developed are compatible, safe, and of a standard that will generate benefits.

3.1.2. Strategy, Franchising and Sponsorship

Strategy, Franchising and Sponsorship is charged with identifying, developing and articulating the projects, investments, and activities that the DR Programme undertakes.

Working across the DR Programme, government and the rail industry, this team sets out the strategy and objectives and engages with key stakeholders on strategic issues.

They lead the DR Programme's work on business case development and approval for digital railway projects, working closely with Routes and funding stakeholders.

They work with the Routes to manage and coordinate plans and investments in digital technologies.

They set the remits for the delivery activities and projects in the DR Programme to maintain focus, efficiency and consistency across the programme's various activities.

3.1.3. Digital Initiation Directorate

The Digital Initiation Directorate (DID) is responsible for DR Programme engagement with specific schemes, for enablers, industry readiness, training, specialist skills, and other requirements needed to initiate digital technology implementation on the rail network.

The DID works closely with front-line developers and deliverers of digital technology and provides them with advice, expert support, and some additional funding to progress implementation of technologies.

They are also working on behalf of the rail industry to establish industry-wide capabilities and processes that manage the interfaces and shared requirements for digital technology implementation.

They are leading a number of specific projects to develop new capabilities that will be shared by users across the rail industry and which require collective funding and consistent access and benefits to multiple users.

3.2. Operating model – present and future

The DR Programme is focused on solving real problems and challenges faced on the network today, through:

1. Adopting a route-centric approach with cross industry involvement in the production of business cases to support funding decisions.
2. Solutions based around three systems which can be deployed today (see section 3.2.2) and are accepted by rail industry partners as the right solutions.
3. Identifying candidate schemes based on alignment between performance, capacity and safety needs and renewals and franchising opportunities. Enabling Routes to incorporate digital ready specifications into conventional signalling interventions in advance of digital deployments.

The remainder of this section details the DR Programme's key activities planned to meet its objectives in CP6:

- Business cases and funding
- Technology development
- Programme Management

- Programme Governance
- Development of new Delivery Models

3.2.1. Business Cases and Funding

3.2.1.1. Business Cases

The ORR's Final Determination funding (for operation, renewal and maintenance of the GB rail network) does not provide sufficient funding for any digital schemes to be taken forward to completion.

This reflects the DfT's decision only to include the central costs for the DR Programme in the Final Determination and that all deployment funding, beyond Routes' own allocations from their portion of the Determination for CP6, is subject to specific Final Business Cases[17] and Enhancement funding.

To deliver the DR Programme's service objective of supporting feasibility studies and business case development, the following candidate deployment business cases are being progressed with approved funds from NPIF (see 3.2.1.2 below):

- An Outline Business Case for ETCS and TM deployments on LNE Route (ECML South) including required passenger and freight train fitments; and
- A Final Business Case for TM on South East Route.

For other candidates being considered, such as additional studies that could be funded from NPIF or from the ORR's CP6 Final Determination Enhancements fund, the DR Programme anticipates that these will be subject to change control and added to the consolidated expenditure plan in a controlled manner upon agreement to progress with funders. This includes ETCS and TM schemes for the TransPennine Route Upgrade (TRU), ETCS and TM schemes on LNW Route (including Manchester area and Crewe) and studies on the Wessex suburban line (Feltham area), work in association with Crossrail 2 and replacement for Automatic Train Protection on Western and Chiltern as well as the new East West Railway where the cases for digital railway substitution of conventional signalling renewals and deployments are being examined.

In addition to this approach Western Route has taken forward a supplier / NR collaboration to pilot a traffic management system at Didcot and Thames Valley Signalling Control Centre ('Didcot'). A review of benefits will be undertaken with the Route and supplier during the trial year period following its deployment in summer 2018.

3.2.1.2. Funding

Although the Final Determination does not provide funding for any complete digital rail deployments, alongside DR Programme funding, it also provides for some national enabling activity.

The Route Services function is responsible for: fitment of ETCS to on track machines (NR and third party) and business change support; training infrastructure contributions; and maintenance of IT systems enabling deployments of digital train control and signalling technology. STE is responsible for digital railway systems Research and Development within its wider portfolio.

In addition, in the Autumn Statement 2016, a new National Productivity Investment Fund (NPIF) was announced to be targeted at four areas including transport, within which an allocation was made for £450m proposed for testing

[17] As set out in the investment decision framework (HMT's 'Green Book'), required in the Memorandum of Understanding agreed between Network Rail and the DfT signed on 23 March 2016

signalling technology. The targeted spend profile for the NPIF is shown in Table 5.

Table 5: NPIF target spend profile

NPIF Target Spend Profile in 2016-17 Cash Prices				
Years	2018-19	2019-20	2020-21	2021-22
Spend (£ million)	50*	150*	250*	*

* Note the target spend profile set out by the DfT above are caps in each year, with an expectation that some under spending between 2018-19 and 2020-21 will be pushed back to 2021-22, up to a limit of £190m.

To deliver the programme's service objective supporting access to funding, a list of candidate activities enabling or providing for early deployment of digital railway technology has been developed by the DR Programme and the DfT, shown in Table 6 overleaf. Some of these schemes overlap with DR Programme's business case proposals to DfT for funding outside the NPIF for Route schemes and other enabling activity for wider systems implementation. Where candidate schemes have sufficiently strong business cases, remaining funds available in the NPIF will be sought for continuing case development and/or scheme delivery.

Within Table 6:

- A blue background indicates funding has only been approved for the development phase; and
- An orange background indicates funding has been approved subject to the DfT receiving a satisfactory bid in response to the franchise Invitation to Tender.

Table 6: NPIF candidate schemes and enabling activities granted funding by DfT (as at 31/01/2019)

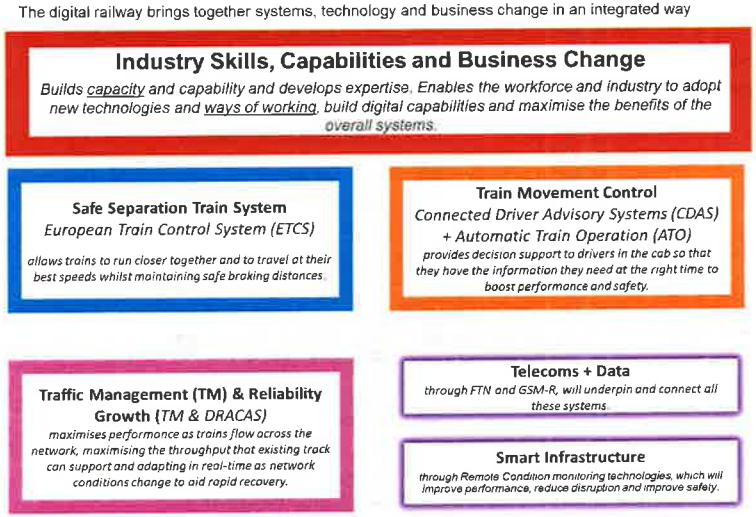
Name of scheme	Brief description of the funded activity	Benefits enabled and primary outcomes
First in Class fitment and testing	**Deliver** selected First in Class fitment and test facilities at RIDC and ENIF.	• Cab fitment enables ETCS schemes below and test facilities are enablers for all schemes below.
Freight First in Class fitment	**Deliver** further freight First in Class fitments.	• Cab fitment enables ETCS schemes below.
TM on South East & East London Line *Note: this excludes the franchise area covered by separate scheme below.*	**Develop** FBC for TM on South East (excluding franchise area) & adjoining section of East London Line routes. (£5m funded OBC completed November 2018).	• 5 – 7% reduction in delay minutes. • Performance and safety.
DR options between Manchester and York including TransPennine	**Develop** digital railway options for the TRU to be included in the wider options.	• Capacity, performance and journey time improvements.
ETCS on Moorgate Branch	**Develop** OBC for ETCS L2 renewal without lineside signalling on the Moorgate Branch of East Coast Mainline	• +2 – 4 tph. • Capacity, performance, safety & asset renewal.
Castlefield Corridor	**Develop** SOBC for TM on the Castlefield Corridor and surrounding area.	• 3 – 6% reduction in delay minutes.
ECML South OBC	Contribution towards **development** of an OBC for ETCS and TM on the East Coast Main Line South. OBC due for June 2019.	• +2 tph. • 1-2% PPM Improvement. • Capacity, performance, safety & asset renewal.
TM in Southeastern Franchise	**Support** from the DR Programme to prepare invitation to tender documentation and evaluate tenders.	• 3 – 6% reduction in delay minutes. • Performance and safety.
TM in Southeastern Franchise	New franchisee to **develop, design and deliver** TM scheme on Southeastern franchise area. Franchise due to start April 2019.	• 3 – 6% reduction in delay minutes. • Performance and safety.

3.2.2. Technology

An overview of the systems, technologies and business change contained within DR Programme is set out in Figure 2 below.

This includes enabling activities such as upgrading of telecommunications and data systems through FTN and GSM-R to meet enhanced ETCS availability requirements. Network Rail's strategy for telecommunications is integral to the DR Programme in providing current and near term enabling connectivity, as well as developing a network and service platform for future control, command and signalling applications.

Figure 2: Scope of the proposed DR Programme with enabling activities.



DR Programme initiatives for CP6 planned to support delivery of the targeted DRP Systems include:

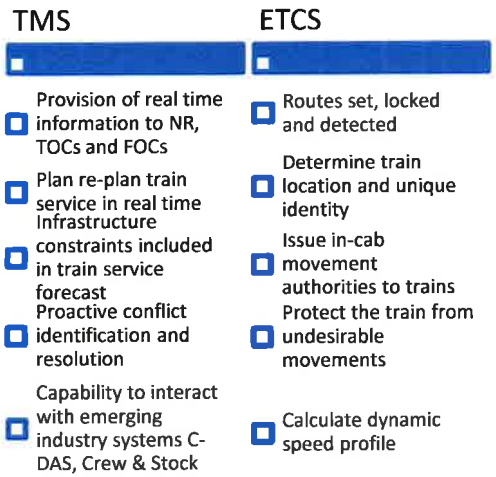
- Support to Routes in the development of their plans and technology upgrades
- Support to business change requirements, operational development, engineering and project management through provision of specialist expertise
- The development of the RIDC testing facility and related verification and validation processes for use on the DRP Systems
- First-in-class train fitments
- Development and establishment of new functions and tools to benefit the wider rail industry, e.g. DRACAS, Joint Development Group, DR System Authority
- Continued support to help the rail industry meet training, operational processes, and timetabling needs that digital rail technologies require

3.2.2.1. DR Programme Systems

The DR Programme supports the delivery of Traffic Management Systems (TMS), European Train Control System (ETCS), and some associated enabling systems, together referred to as the DRP Systems.

The principal functions of DRP Systems are set out in Figure 3 followed by a brief description of each system.

Figure 3: Digital Railway Systems' principal functions



ETCS is a control, command and signalling system with automatic train protection. ETCS is based on cab signalling and transmission of data between track and train. In ETCS level 2, movement authorities are given directly to the driver through the in-cab display and the system can apply the brakes in the event of a train exceeding its authority to move, including overspeed. ETCS level 2 requires that both train and the track are fitted and so the line side signalling cannot be removed from a section until all trains that may use that section are fitted with the onboard ETCS equipment. There are different configurations of ETCS which can support migration from conventional signalling and control technology to ETCS Level 2 by allowing mixed operation of trains fitted and trains not fitted with ETCS.

An Integrated TMS consists of two elements: a planning and operations layer and a signalling control layer. The planning and operations layer provides real-time information to operational staff and to other operational information systems and allows prediction and resolution of conflicts. It also enables real-time timetabling and re-planning as required. The signalling control layer requests routes from the interlocking and provides the planning and operations layer with details relating to the current state of the railway supplied by the interlocking. This enables the planning layer to provide automated route setting requests to the control system. A TMS allows the control of rail traffic at a strategic route level as well as at the tactical level in day to day operations. TMS will also provide an interface with C-DAS.

There are three variants of TMS:

- Operational Decision Support Tool: the planning and operations layer receives updates on the state of the railway from external systems. Conflict resolutions can be proposed to the user by the system or be identified by the user simulating the impact if necessary. The signaller continues to control the railway through their existing signalling control system. The signaller is presented the current updated timetable plan on their Operational Decision Support Tool interface and can manually implement the plan through the signalling control system. The TMS allows users to simulate solutions and view the impact in the forecast providing confidence that the resolution will achieve the optimum solution.
- Interfaced: this configuration provides the planning functionality of the planning and operations layer equal to that of the ODST but takes advantage of a technical interface to the signalling control layer. Route setting can automatically be requested via the signalling control route setting sub-system. The key addition of this variant over the ODST variant is the system automatically requests routes to be set in line with the current train plan.
- Integrated: in this configuration users are presented at the signalling control layer with a single integrated interface to the system, allowing both automatic and manual control of the railway. The TMS can communicate directly with field equipment to relay the

state of the railway and can transfer areas of control between workstations within a Rail Operations Centre to allow flexible workload management. A unified voice solution has been developed as a part of the TMS first deployment to enable reconfiguration of telecommunications to align to reconfigurable signalling control.

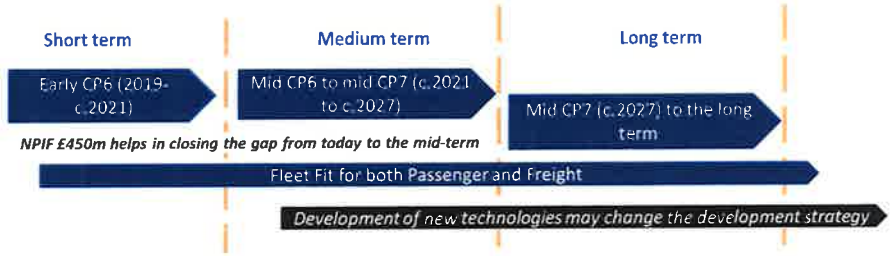
Telecommunications and Data Management - there are a number of key enabling activities to support the technologies described above, chiefly telecommunications and data management upgrades. Enabling telecommunications and data management activities include:

- Design and implementation of works for both new Global System for Mobile Communications-Railway (GSM-R) base-stations (infills) and upgrades to existing GSM-R base-stations;
- Design and implementation of works for both new Fixed Telecommunication Network (FTNx) infrastructure and modifications to existing;
- Upgrade of the GSM-R core to enable delivery of GPRS, a key enabler for increased capacity and Online Key Management; and
- Supporting data management services include data acquisition, validation, storage, processing, management, change control, analysis and provision of all system requirements for implementation and operation of the Digital Railway.

3.2.3. Programme Management

The programme's delivery strategy reflects activities delivering outcomes over the short, medium and long term, some of which run in parallel with each other (Figure 4).

Figure 4: Programme delivery strategy



3.2.3.1. Short Term: Committed projects, learning lessons and transition planning

Focus towards the end of CP5 has been on key projects that will deliver benefits through current demonstration of digital train control at Thameslink, Crossrail 1, Upminster, Cardiff and Western.

The costs included in this DR Programme Delivery Plan reflect those remaining elements that fall within the DR Programme's responsibility, for learning lessons from early deployments in CP5, of TM at Upminster, Cardiff and Didcot (deployments within the Thameslink and Crossrail projects are outside the DR Programme's control).

During CP6, the DR Programme will develop a disposition statement to propose how the functions of the programme would be devolved within Network Rail and the wider industry to move towards 'business as usual'.

3.2.3.2. Medium Term: Targeted Deployments and DR Readiness

The SBP published in February 2018 reflected Network Rail's commitment to a digital railway and included a number of schemes for deployment in CP6, reflecting the

business cases that had been developed up to that point.

However, in the lead up to CP6, clear prioritisation decisions on the aspired DR schemes have been necessary in the light of available funding identified in the Statement of Funds Available (SoFA) and the ORR's Final Determination.

Since the Final Determination does not provide sufficient funding for any digital schemes to be taken forward to completion in totality, some enhancement funding will still be required from the DfT to deliver digital schemes and train fitment in CP6.

To choose which schemes to prioritise for enhancement funding, the Digital Railway portfolio has been assessed for strategic fit using the objectives set out in the recent DfT 'Rail Network Enhancements Pipeline'.

Economic value has been established from business cases. Where a business case has not been completed or is underway, these have been inferred. Constraints have then been applied to the portfolio, recognising that, at this early stage of portfolio development, the consideration of risk and deliverability is more limited and the main constraint considered at this stage is affordability.

Approved funding for enabling schemes is reflected in DR Programme costs and for South East Route's OBC scheme development in that Route's Delivery Plan. Costs of other candidates for this fund are not represented separately in the DR Programme Delivery Plan, as (on authorisation) they will represent a funding contribution to the Routes' schemes.

Funding of wider system implementation will need further discussion with DfT, including consideration of a mix of SoFA, NPIF and other specific DfT funding, driven by enhancement business cases for targeted schemes and enabling projects required for Routes to deploy digital technology. These deployments will employ an integrated systems approach using a validated set of templates and frameworks and a tested approach to supply chain engagement focused on outcome delivery, reflecting the lessons of early deployments.

Each scheme will be based on individual business cases, with initial CP6 deployments bearing some enabling costs that will also benefit future schemes. Such national enablers managed by the DR Programme include ETCS in-cab fitment, test facilities and telecoms upgrades.

Projects are being managed in a co-ordinated way, regardless of funding source and resulting governance variations, whether CP5 deployments, candidates proposed for funding from the £450million NPIF, or those seeking alternative enhancement funding from DfT or third-party finance. Similar project co-ordination will be in place for CP6, where funding may be drawn from the NPIF fund, allocations from the Final Determination or through other enhancement business cases. This will enable consistent application of core DR Programme approaches, skills and capabilities to maximise cost efficiency and interoperability of technologies across the network.

As funder approval is granted for some or all of the NPIF Business Cases and Route funding submissions, the relevant Routes, the DR Programme team, and other key stakeholders will agree their more detailed roles, responsibilities and working relationships reflecting the number of projects likely to be progressed in CP6. They will then be able to choose the best balance of local ownership versus central co-ordination and oversight, clarifying how the 'thin client' approach should work in practice to meet their needs.

As Network Rail strategy is now to deploy DR or DR ready technology, unless there is a clear and compelling reason

not to, it has been necessary to review the CP6 signalling workbank which was developed on the basis that the default would be towards conventional technologies. By the time Network Rail's Delivery Plan is published, the workbank will have been adjusted to support the strategy and, as longer-term plans mature, the CP6 workbank will be reviewed regularly to check that it continues to best meet this aspiration.

3.2.3.3. Longer-Term: Digital as the default

Digital Railway is developing a longer-term infrastructure plan, to substantially address the much increased requirement for signalling renewals in CP7, 8 and 9 which are significantly greater than the affordable and deliverable volumes achieved in previous Control Periods. An initial baseline view of the plan will be completed by March 2019. This will be a plan led by signalling asset condition and integrated with achievable train fitment, to complete a digital technology based renewal of the network taking asset renewals, deliverability, drivability and affordability into account. It is assumed therefore that in subsequent funding cycles, candidates would again be prioritised by safety and need, and the plan updated. Traffic management and control strategies will be integrated into the plan.

3.2.4. Governance

The DR Programme has its own DR Programme Investment Panel, Commercial Panel and Change Panel which provides specific programme controls related to DR Programme expenditure. To complement this, the DR Programme governance with its Programme Board and alignment to the DfT/ NR Memorandum of Understanding on Enhancements also enables milestones to be monitored against expenditure. The existing governance structure also aligns with Network Rail corporate governance and the Routes' governance, as well as enabling industry stakeholders to provide strategic direction.

3.2.5. Delivery Models Under Consideration

In CP5, the DR Programme collaborated with stakeholders as part of Early Contractor Involvement (ECI) workstreams, to meet DR Programme's service objective of supporting commercial and procurement activities for the deployment of ETCS and TM. These workstreams identified opportunities and supply chain appetite for innovative whole life solutions, including from a much earlier stage in scheme development, enabling better value for money.

The DR Programme is currently considering commercial packaging and delivery options as well as various financial models. All models will be evaluated against identified 'red lines' as well as commercial objectives. These considerations will lead to fully developed recommendations as part of the next phase of business case development.

Some procurement started in 2018, which was necessary to deliver in CP6, and includes innovative elements such as:

- Outcome based specifications
- Whole-life relationships, enabling the possibility of locking in a whole-life price
- Innovative payment structures that incentivises in-service performance and reliability
- Closer relations with the Supply Chain and earlier involvements than is currently the case
- Thin Client model with a risk-based client oversight role
- Technology risk transfer

The measures above would also facilitate the potential for third party financing or funding (contributions) and this is

currently being explored.

A Joint Development Group (JDG) has been mobilised by the Programme in order to connect the right skills and competencies from a community of suppliers (currently numbering around 180) to Digital Railway project teams. By jointly developing solutions to complex and unconventional problems, the JDG can potentially unlock new and innovative ways of driving efficiency, meeting the capacity and performance challenge and achieving value for money on the journey to delivering Digital Railway Systems. This is an important change – our supply chain will be involved far earlier in the process than currently – at development stages.

The DR Programme is investigating options for use of the JDG into CP6.

4. Risks, opportunities, constraints & assumptions

Summary of objectives	The DR Programme must provide, within the constraints of our agreed cash envelope: • Capability - the knowledge of the DR systems and how to implement, operate and maintain them; and • Capacity – additional resource to undertake the workload to implement the DR systems.

No.	Key constraints, risks and opportunities	What we plan to do	Owner	Timescale (finish)
1	**R:** A suitable volume of resources, with the right skills is not available at the right time to deliver the programme director's remit.	• Focus prioritisation via Programme Board and make sure that adequate resource plans are in place for the programme • Agree funded priorities for CP6 inside Network Rail and with key stakeholders • For any new projects proposed, carry out an impact assessment including a resource and skillset assessment • Maintain momentum to manage Supply-chain engagement in the short and medium term, including visibility of evolving Industry Schedule.	DRP Programme Director and Head of Strategy, Franchising and Sponsorship, Digital Initiation Director, Commercial Director	2024
3	**R:** The early deployments may not adequately demonstrate the benefits of DR products to support business cases for future deployments	• Monitor Supplier corrective action plan • Programme Delivery: re-baselined & de-scoped to deliver ODST (TM isolated) to Anglia & Wales Routes. • Build Route commitment to benefits realisation through support development of post implementation operations, ensure Route delivery of required training • Harvest benefits realisation from early schemes to substantiate applications for funding • Capture and disseminate lessons learned • National TM Strategy developer	DRP's Head of Strategy, Franchising and Sponsorship, Digital Initiation Director, and Routes (Anglia, and Wales)	2024

No.	Key constraints, risks and opportunities	What we plan to do	Owner	Timescale (finish)
3	**R: Lack of Funding (NPIF/Enhancement Pipeline) or appropriate Financing availability to support the Digital Rail Programme development & delivery, due to:** i) Business Case not sufficiently attractive to secure government funding, ii) Wider fiscal pressures result in non-availability of government funding for DRP iii) Proposed financing models may not be suitable for Government/HMT to support Digital Rail schemes, iv) Digital Railway is not an attractive investment in the Private Finance market v) Lack of demonstrable cross Industry support for DRP	• Ongoing engagement with DfT and Treasury to clarify expediency of drawing down funds and clarify assurance requirements to ensure timely & positive funding decision-making • Key scheme procurement and contract award within the specific time constraints for the NPIF draw-down • Integrate delivery approach with railway industry through monitoring performance of integrated industry-wide plan through effective industry governance • Issue ITTs against CP6 milestones (Feltham, TRU) • Monitor quantity of benefits from deployments and ensure transfer of lessons learned across the programme (e.g. Thameslink capacity benefits) • Joint DfT/NR Private Finance workstream to review suitability and applicability of Private Financing to ETCS and Traffic Management Schemes • The National Traffic Management Strategy workstream to define and create greater clarity on the potential of procuring TM Software as a Service • Develop a renewals-led plan for CP7 which will provide the basis on which ETCS opportunities can be identified and that phase out Conventional Signalling	DRP's Head of Strategy, Franchising and Sponsorship, Digital Initiation director, Finance Director and Routes	2024
4	**Potential loss of cross-industry support for DRP or greater / more lengthy endorsement process required to maintain support**	• Ongoing engagement with key stakeholders through governance structure and via Routes • Maintain momentum to manage Supply-chain engagement in the short and medium term, including visibility of evolving Industry Schedule. • Harvest benefits realisation from early schemes to substantiate applications for funding	DRP Programme Director and Head of Strategy, Franchising and Sponsorship, Digital Initiation Director, Commercial Director	2024

No.	Key constraints, risks and opportunities	What we plan to do	Owner	Timescale (finish)
5	**R: DR system applications scope fails to match safety expectations of Regulators** i) Failure to deploy TM protection and SCWS will reduce possible DR benefit realisation. Deployment of these technologies will provide complementary safe and efficient access to the infrastructure to undertake required inspection and maintenance. Without these systems DR technologies will reduce access opportunities and could impact train performance counter to the DR business case benefits ii) Failure to deploy TM protection and SCWS will result in possible ORR enforcement action on DRP or Routes. ORR view is that these technologies are reasonably practicable. Failure to deploy where possible would breach safety by design principles in CDM Regs. iii) Failure to adopt EULynx will mean SCWS will need individual interfaces to each system including TM Protection, SCWS, level crossings etc.	• Avoid Enforcement Action by deploying these technologies where reasonably practicable. • Seek benefits Realisation - Deployment of these technologies will provide complementary safe and efficient access to the infrastructure to undertake required inspection and maintenance. Without these systems DR technologies will reduce access opportunities and could impact train performance counter to the DR business case benefits • Look for contribution to NR enterprise risk reduction targets • Open interfaces and definition of system requirements; Business case funding. • SRB (System Review Board) reviewing generic safety case • Introduction of TM protection and SCWS will contribute to NR enterprise risk reduction targets	DRP Head of DR System Authority	2024
6	**R: Delays to upgrade of Telecoms Core Network through:** i) Lack of funding ii) Delays in Supplier Procurement iii) Complications in delivery iv) Stakeholder delays	• Documentation of cross industry requirements aligned to technical capabilities of systems. • Documentation of baseline schedule plan for telecoms upgrade. • Proceed to CP6 Year 1 panel sign-off to proceed with supplier procurement to upgrade Core GSM-R network to provide GPRS packet switch telecoms capability • Seek to deliver by CP6 Year 3 and pass the uplifted GSM-R network to a NRT-managed asset in 2022 • Monitor and support NRT readiness to maintain telecommunication services to the railway and its customers to the service levels required for a safe, secure and reliable railway	DRP Digital Initiation Director, Director Telecoms Asset Management	2022

No.	Key constraints, risks and opportunities	What we plan to do	Owner	Timescale (finish)
7	**R: Testing Facilities incomplete, uncertain outcomes or unforeseen outcomes**	• Documentation of cross industry requirements aligned to technical capabilities of systems. • Documentation of baseline schedule plan for testing facilities and integration. • Execute the DR Testing, V&V (verification and validation) and Integration Strategy • Assess feasibility, develop and implement a National System Integration Partner (NSIP) to support the DRP • Unify the current NR Testing and Integration facilities, providing Centres of Excellence that meet the industry testing and integration needs. • Assessment of the existing test and integrations facility capabilities followed by the development of a Recommendations Report that identifies and recommends upgrades to support industry Testing and Integration requirements • The development of a Systems Integration Laboratory (SIL) capability that supports multi supplier (infrastructure & Onboard) solutions testing, V&V and integration, a key capability to support the entry into service process	DRP Digital Initiation Director, Head of DRP Testing, V&V & Integration	2022
8	**O: Boosting train control and performance through connected systems**	The Programme is examining how people and processes can improve the performance of passengers and freight customers' train journeys through the adoption of digital support tools for signallers, drivers and controllers.	DRP Digital Initiation Director. Routes and NR System Operators, TOC/FOCs	2024
9	**O: Capacity to accommodate demand**	Much of the signalling infrastructure currently in place is based on the principle of dividing tracks into fixed sections. The fixed sections are not optimised for all services, as a result, trains which could safely run closer together are barred from doing so, resulting in a network that is under-used, with an impact on frequency of service and journey times. The Programme is working with NR capacity planning teams to develop ways to use additional capacity this creates (both from deploying currently available technologies and those still being developed).	DRP Digital Initiation Director. Routes and NR System Operators, TOC/FOCs	2024

No.	Key constraints, risks and opportunities	What we plan to do	Owner	Timescale (finish)
10	**O: Improve skills by developing next generation skills essential to continued success of the UK economy**	The ongoing evolution of the skills, knowledge and expertise that Digital Railway will bring will provide a benefit which can be transferred to other infrastructure sectors[18]. The DfT's Transport Infrastructure Skills Strategy "Existing staff will need greater systems engineering, advanced telecoms, software programming and crucially business change skill sets to help fully realise the benefits of a digital railway"[19]. Successful development will build upon the industry's existing capability, and give the opportunity to boost exports; As well as building rail capability, Digital Railway can also enable skills to be realised across other industries – by bringing about agglomeration benefits that allow greater connections between skills and jobs, and goods with markets. Digital Railway has the potential to extend the catchment area of major cities. Accelerating these benefits could unlock additional productivity and economic growth for the UK economy. We're working to tackle the skills agenda across the rail and transport industries collaboratively, by developing apprenticeship standards, training, coaching and development opportunities.	GDR Director, Programme Technical Services and Supply Chain, (GDR) DRP Digital Initiation Director	2024

4.1. Notable assumptions

Required funding will be secured for enabling activities overseen by the programme e.g. fleet fitment so that DR Programme objectives can be met within CP6. Early deployments of DR systems will demonstrate benefits sufficiently to support business cases for future deployments. Resources with the right skills will be available in sufficient capacity, particularly inside the programme and in the supply chain, to enable delivery of programme objectives.

For the Route Digital Railway business cases and studies completed to date, some critical assumptions have been made around investments enabling the Digital Programme, which are set out in each Route's Delivery Plan.

[18] Institution of Civil Engineers (2016) "The case for internalising externalities in a sustainable rail asset base" p1
[19] Department for Transport (2016) "Transport Infrastructure Skills Strategy" p 42

5. Expenditure & Efficiency – DRP Business Unit

This plan is predicated on the notable assumptions laid out below and will be impacted as these assumptions change

5.1. Cost and volume summary – DRP Business Unit

Table 7: Expenditure (post headwinds and efficiencies in cash prices)

Unit of measure		CP5	CP6					CP7	
		18/19	19/20	20/21	21/22	22/23	23/24	CP6	24/25	25/26
Renewals	£m	70	21	25	37	17	3	103	0	0
Controllable opex	£m	3	15	18	21	17	18	89	0	0
Non-controllable industry costs	£m	0	0	0	0	0	0	0	0	0
Total	£m	73	36	43	58	34	21	192	0	0
Permanent Headcount		117	105	100	90	80	70	-	-	-
Agency		15	20	0	0	0	0	-	-	-
Total headcount		132	125	100	90	80	70	-	-	-

5.1.1. Basis for costs

These cost estimates in Table 7 and Table 8 represent DR Programme business unit costs only, which are not included in any Route's or other central function's Delivery Plans. Overall costs fall at the start of CP6, as the programme completes its early deployments in CP5 and moves from its advocacy role (including successful launch of the DR Strategy by government) to take up its 'thin client' role supporting Routes and co-ordinating national enabling activities.

No planned costs or headcount in CP7 reflect that the DR Programme is a change programme with a finite life. A disposition statement will be devolved within Network Rail and the wider industry to move towards 'business as usual' by the end of CP6.

Table 8: Summary of costs by team or activity within the function (cash prices)

Activity/team	CP6 total (£m)	Comments
National Enabling Portfolio	96	Core enablers portfolio – including; test facilities, (ENIF, RIDC and System Integration Lab) and telecoms upgrades, (core GSM-R network) and online key management, train development and timetable requirements.
Core activities / organisation	67	Includes Senior Leadership team, Programme Management Office, Procurement and Commercial team, Strategic Planning and Sponsorship function, Business Change, Systems Requirements and Integration team, Digital Initiation core team, Rail System Technical Advisory and Assurance team and industry partners support costs e.g. RDG and RSSB.
TM maintenance and support	22	Maintenance and support for traffic management system deployments
Committed support to Route Clients	7	Includes completion of the TM first deployments portfolio e.g. Anglia and Wales and current Route remitted activities.
Total (£m)	**192**	

Note: GDR leadership cost held separately within GDR Support.

The DR Programme has worked with Routes to agree in principle the balance of responsibilities in a 'thin client' approach and from this has determined the central programme running costs and cost requirement for a DR System Authority shown. The Programme is also responsible for the national enabling portfolio including test facilities and telecoms upgrades. These cost estimates have been derived from the estimates of the workstreams planned for delivery of the programme objectives set out in Section 2 above.

5.2. Route Business Scotland details

The DR Programme is continuing to support Scotland Route in their development of a signalling asset management plan for Scotland.

5.3. Cost drivers, headwinds and efficiency

In CP5 the DR Programme has been focused on developing a programme strategy, technological system requirements and test facilities, concepts of operations, pilot deployments to learn lessons, business cases for larger targeted deployments, and an integrated schedule of work and industry stakeholder engagement.

As the programme moves into a very different level of activity, supporting wider system deployment in CP6, it is not meaningful to compare the programme's costs from one control period to the next.

The key headwind facing the DR Programme would be greater unbudgeted demand from Routes and industry for support from the programme.

The main tailwind would be third party interest and funding of works e.g. East West Rail and HS2.

Potential efficiencies envisaged through the Sector Deal and Long Term plan arrangement.

5.4. Risk and uncertainty in the CP6 plan

Costs in our plan are based on current rates but include any additional scope needed to deliver the outputs in the plan. We have used 2016/17 unit rates to develop our capital expenditure forecasts and CP5 exit rates for support and maintenance expenditure forecasts. Drivers of rate increases (headwinds/inefficiencies), or rate reductions (efficiencies/tailwinds), where there is a reasonable expectation they will occur, have been identified separately from the core CP6 plan.

The combination of our core CP6 plan, headwinds/tailwinds and efficiencies/inefficiencies is our 'submission'. The content of our plans reflects the SoFA funding that is available in CP6 via the Final Determination.

5.5. Uncertainty ranges for CP6

See section 5.4 above

5.6. Financial Sustainability strategy

Network Rail has acknowledged that there is a lack of customer focus in its structure and culture and shortage of wider sources of funding and financing for enhancements which is a priority as passenger demand continues to increase. The DR Programme is contributing to Network Rail's addressing of these points by reducing whole life costs and also seeking out third party funding and financing to improve the affordability of digital train control and signalling enhancements in CP6. This will support Network Rail's wider vision to look and behave more like a normal private sector company.

5.7. Digital Railway strategy

See sections 1-3 above.

5.8. Telecoms strategy

The DR Programme's dependence on delivery of Network Rail's telecommunications strategy is set out in section 3.2.2 above.

5.9. Property strategy

N/A.

6. Sign-off

- This document and accompanying templates are owned by the Managing Director, Group Digital Railway.
- Submission of this document indicates confirmation that:
- all appropriate level 1 assurance activities have been undertaken (see separate advice on definition of level 1 assurance);
- the Managing Director, Group Digital Railway is satisfied with the quality, currency and appropriateness of the content of this document as well as the cost, volume and activity projections to which it refers;
- the signatories are satisfied that the plan has been assessed as deliverable, subject to the assumptions articulated in Appendix B.

Authorised by:

S. Calvert

PP. **David Waboso**
Managing Director,
Group Digital Railway

08/02/19

John Gerrard
Finance Director,
Group Digital Railway

08/02/19

Michael Flynn
Programme Director,
Digital Railway Programme

08/02/19

Appendix A Supporting strategies

Appendix A outlines the Corporate Strategies and the implications on the DR Programme Specific Objectives. This is outlined in Table 8.

Table 8: Corporate Strategies and Implications on the DR Programme

Network Rail Strategies	DR Programme Implications
Safety strategy – drives continued and sustainable improvement of safety in close collaboration between the centre, the routes and with key stakeholders inside and out of Network rail	DRP's continuous safety improvement objective will contribute to delivering Network Rail's safety strategy through deployments of digital traffic management and train control systems improving train protection in a wider range of circumstances than current systems can deliver.
Security strategy – mitigates security threats to railway assets, people and railway services	Whilst digital communications and internet-based technologies can give rise to cyber security risks, DRP shall embed Network Rail's wider security strategy to manage this risk to operating the railway.
Operational Performance strategy – outlines the key principles within which the business will operate in the future	The potential for improved reliability arising from the use of digital train control and signalling technologies relies in large part on updating processes and behaviours to enable best use of the technology and on designing technology to reflect the knowledge and expertise of those managing operational performance. Thus DRP and our Route-based colleagues will be working closely together to help each other realise our objectives.
Capacity and timetabling strategy – planning to deliver a zero-defect timetable that's safe, robust and able to accommodate growth	The potential for additional capacity arising from the use of digital train control and signalling technologies relies in large part on better and more accurate timetabling to make best use of infrastructure and train capabilities. DRP will be working with System Operator colleagues to help each other realise our objectives.
Sustainable Development strategy – a central framework against which the routes and other operational business areas set/deliver their priorities to enable sustainable and responsible business performance	Whilst Network Rail's current sustainable development strategy covers a broad spectrum of issues which include: environmental responsibility, social responsibility and enviro/socio economic responsibility, DRP's key contribution is in the area of economic sustainability, to find lower whole life cost solutions to the expected bow-wave of life-expired signalling assets that will need renewal in CP7 and beyond.
Technology (R&D) strategy – builds technical capabilities that lead to a new Business as Usual capability and drives new value from the railway	A significant element of STE function's Research, Development and Technology (R, D&T) funding for CP6 is intended to support continuing development of digital train control and signalling technologies at a more sustainable (lower) whole life cost than existing conventional technology.
Network Rail Strategies	**DRP Implications**

Network Rail Strategies	DRP Implications
Innovation strategy – provides a framework to deliver a safer, more efficient railway from successful R&D programmes	Digital train control and signalling technologies will be deployed for the expected improvement in whole life cost through implementation of the innovative commercial and procurement proposals in this plan.
Asset Management Capability strategy – creates a resilient 7-day railway with world-class asset management that improves reliability, increases capacity and reduces delays	Network Rail's delivery of increasingly efficient whole life asset costs for train signalling and control systems is dependent on the replacement of conventional technologies with digital, where there is a business case.
Planning a Better Network strategy – creates a long-term view that uses detailed knowledge from capacity planning and timetabling to enable the seamless provision of cross-boundary services	To realise Network Rail's corporate goals of delivering a more reliable railway and addressing the forecast levels of passenger growth, it will be necessary for the GB railway system to start using digital railway technologies so that best use can be made of the capacity available on the network.
Project Delivery (IP) strategy – unifies the business operating model across IP's Regions, programmes and functions	DRP's objectives are supported by Infrastructure Projects' (IP) strategy for safely delivering infrastructure projects on time, to requirements and cost for clients.
Wheeled Plant strategy – represents a complex portfolio of assets that may be owned, leased or provided as a part of an overall bought in service to support the operation, maintenance, renewal and enhancement of the network.	Deployments of ETCS will be enabled by a Wheeled Plant strategy that will provide a coordinated approach across the organisation taking into account the input of our customers, supporting supply chain and associated stakeholders.
Maintenance strategy – focusses on the development of tools, processes and technology to support the devolved routes	DRP is developing new ways of working with maintenance colleagues to support the delivery of improved safety, reliability, economic sustainability and growth objectives as a result of the deployment of digital railway technologies.
Operations strategy – a framework for Route Operations Strategies to be developed that concentrate on a system approach	DRP is developing new ways of working with operational colleagues to support the delivery of improved safety, reliability, economic sustainability and growth objectives as a result of the deployment of digital railway technologies.
Contracts and Procurement – creates a corporate framework that clearly identifies a local, regional and national approach to leverage the total third party spend in the most effective and efficient manner	DRP's objectives are supported by Contracts & Procurement's (C&P's) most important strategic aim for the programme, of delivering innovative sourcing solutions. We are working with colleagues in C&P and in IP on this key plank of our ECI programme to deliver digital technologies at more sustainable costs than their conventional equivalents.
Corporate Communications – centrally led corporate communications strategy that establishes overarching objectives for all external communications produced by Network Rail	DRP is contributing to Corporate Communications' strategy of making sure that Network Rail is known for delivering a safe, reliable, efficient and growing railway infrastructure delivered by great people and great teams, by our wide-ranging engagement with stakeholders on the safety, reliability, sustainability and capacity benefits of the digital railway.

Network Rail Strategies	DRP Implications
Quality – drives high quality performance by establishing an operating a framework for continuous improvement	DRP will seek to embed the programmes of work set out in Network Rail's quality strategy to deliver high quality performance which meets our customers' expectations in the most cost-efficient way. The programme also commits to developing and governing content of its processes within the structure provided by Network Rail's Integrated Management System in CP6
Track Worker Safe Access Strategy – to reduce the risk of track workers being struck by train, through wide geographic deployment of strategic high integrity protection and warning systems enabled by Digital Railway technologies	Deployment of TM enabled protection (possession) systems and Signal Controlled Warning Systems (SCWS) will provide complementary safe and efficient access to the infrastructure to undertake required inspection and maintenance.
Human Resources – sets the context and focus of the people agenda to support the delivery of the business agenda through our workforce	GDR is developing an integrated people strategy that encompasses organisational capability, change management and diversity and inclusion, aligning with the national themes of great people, a great place to work and a high performing organisation. One area of focus is to make GDR an employer of choice within what is a competitive job marketplace and to attract the right calibre of applicants.
Information technology – aligns to Network Rail's IT aspirations by governing the daily choices made when planning, designing, procuring, operating and using Information Technology	DRP depends on NR IT's strategic principles to help the programme make optimal decisions to provide the right levels of efficient, safe and effective enabling IT infrastructure for realising the full benefits of digital train and control technology.
Freight and National Passenger Operators – provides a principal point of focus and contact for delivery of excellent service at an efficient cost, to customers who operate nationally across multiple routes and therefore do not align to any individual Route	Deployment of digital train control technology is dependent on in-cab fitment to all train fleets of customers using the route being upgraded
Occupational Health & Wellbeing strategy – aims to form a culture of effective health and wellbeing management, enable through pre-emptive measures a sustainable, healthy and productive workforce and focus on protecting NR's workforce to reduce the impact of occupational health hazards	DRP will maintain a focus on occupational health and wellbeing, delivering and reporting on appropriate projects and improvement programmes in alignment with the Occupational Health and Wellbeing team's goals.

Appendix B Key assumptions

The key assumptions of the DR Programme are outlined in Table 10.

Table 10: Key Assumptions

Ref no.	Topic (e.g. dependency, deliverability, climate etc.)	Assumption	Areas of spend impacted (e.g. all opex, single team, all spend etc.)	Is this a change of assumption for CP6?
A001	Accountability	Individual schemes are set out within Route specific remits which are excluded from the DRP team's scope, as Routes are responsible for each scheme's delivery	All	N/A
A002	Affordability	Business cases provide sufficiently compelling evidence to generate investment	All (including Routes' and other central functions' Delivery Plans)	N/A
A003	Deliverability	The Integrated Schedule reflects prioritised schemes where business cases are being examined, and the most likely solution options within each scheme. It does not reflect anticipated funding decisions, i.e. which schemes or options will be approved and/or prioritised. As such, it does not currently reflect resource constraints –these will be considered following formal business case outcomes.	All (including Routes' and other central functions' Delivery Plans)	N/A
A004	Deliverability	The Integrated DRP Schedule is aligned with the programme Delivery Plan and changes to the Delivery Programme are expected to require change to DRP deliverables.	All (including Routes' and other central functions' Strategic Plans)	N/A
A005	Dependency	Changes to the DRP programme director's remit will be managed through the industry change management process.	All DRP spend	N/A

Ref no.	Topic (e.g. dependency, deliverability, climate etc.)	Assumption	Areas of spend impacted (e.g. all opex, single team, all spend etc.)	Is this a change of assumption for CP6?
A007	Deliverability	Enabling infrastructure programme will finish within proposed delivery windows.	All (including Routes' and other central functions' Delivery Plans)	N/A
A008	Deliverability	Train fitment dates from the train fitment programme are deliverable, including buy-in from TOCs, FOCs and ROSCOs	All (including Routes' and other central functions' Delivery Plans)	N/A
A009	Affordability	Funding for the renewals works, the enabling infrastructure programme and the train fitment programme will be secured.	All (including Routes' and other central functions' Delivery Plans)	N/A
A010	Procurement	Suppliers will be engaged during the development of Systems requirements and integration, to ensure the deployment readiness, and they will have the capacity & capability to deliver.	All (including Routes' and other central functions' Delivery Plans)	N/A
A011	Dependency	It is assumed the DRP will be Business as Usual by the end of CP6 and will no longer exist (noting some functions will continue within central NR or on the Routes, and that these central NR functions or the Routes will apply for suitable CP7 funding in time for April 2024, as part of normal CP7 business planning within CP6).	All (including Routes' and other central functions' Delivery Plans)	N/A
A012	Dependency	The DRP in CP6 will proceed with the medium-term objectives outlined in the Digital Rail Strategy of April 2018 and with the full support of industry stakeholders.	All (including Routes' and other central functions' Delivery Plans)	N/A

Ref no.	Topic (e.g. dependency, deliverability, climate etc.)	Assumption	Areas of spend impacted (e.g. all opex, single team, all spend etc.)	Is this a change of assumption for CP6?
A013	Affordability	The DRP team will meet assumed cost recovery levels for staff supporting Routes deployments	All (including Routes' and other central functions' Delivery Plans)	N/A
A014	Affordability	It is assumed that the DRP will recover costs arising from additional scheme deployments (above are the scheme business cases outlined in this Delivery Plan) by recovering any increase in Route CAPEX projects.	All (including Routes' and other central functions' Delivery Plans)	N/A
A015	Deliverability	The deployment of digital railway technologies may be incremental in nature (i.e. only certain parts of Routes will be upgraded at any time). The Programme's approach to system development should therefore assume that systems must be compatible with existing / conventional infrastructure during long transition periods.	All (including Routes' and other central functions' Delivery Plans)	N/A

Appendix C Scenario planning

Part 1: decrease in total remaining expenditure for CP6

This section describes the impact of a 10% decrease in expenditure across CP6 based on all risk funding has been exhausted.

Area of spend	Outstanding CP6 expenditure	Maximum potential saving	Risk of curtailing expenditure				Comment on impacts/issues
			Safety	Performance	Sustainability	Reputation	
Industry Programme Activities (£78m)		£8m	G	A	G	A	Area of Spend: core DR Programme and assurance activities, Digital Initiation Directorate, business cases and strategy support. Impacts: reduced level of activities may potentially impact the level of key stakeholders engagement and support in particular the first 3 years of CP6.
DR System Authority (£24m)		£5m	G	G	A	A	Area of Spend: technical roadmap guidance, interface to STE, systems requirements and integration product development and support. Impacts: reduced technical guidance and systems requirement and integration may cause inconsistencies across the Routes

Area of spend	Outstanding CP6 expenditure	Maximum potential saving	Risk of curtailing expenditure				Comment on impacts/issues
			Safety	Performance	Sustainability	Reputation	
National Enabling Projects (£68m)		£1m	A	R	A	A	Area of Spend: test facilities and telecoms upgrades. Impacts: test facilities and telecoms upgrades are key enablers to the deployments of schemes. It would impose high performance and reputation risk if funding is not sufficient to complete the remit which some the Route schemes are dependent on.
TM Maintenance & Support (£22)		£4m	G	G	G	A	Area of Spend: maintenance and support for Traffic Management System deployments Impacts: scope of funding to be ascertained to funding available and would be adapted to suit the funds available. Some reputation risk envisaged.
DRP Total (£192m)		£18m					

Key to risk colours

G: no additional risk
A: some additional risk
R: considerable additional risk

Part 2: CP6 scenario planning: investment options

This section describes the benefits of additional investment in the function, over an appraisal period of 30 years.

TM scheme development	CP6 total: (£m)	TBD	CP6 capex: (£m)	TBD	CP6 opex: (£m)	TBD	Total BCR	See table below	Appraisal period	30 years
Description	Qualitative benefits						Quantitative benefits			
Develop and deploy additional shortlisted Traffic Management Schemes: • **LNW Route – WCML(S) TM** • **Wessex Route TM** • **Anglia Route TM** **Shortlist will be kept under review with input from routes.**	**Allows delivery of a wider range of TM schemes at a lower risk because resources could be developed and deployed to enable more robust delivery of a wider range of projects**						**Business cases under continuing review but proposal for funding detailed development will be subject to demonstration of expected benefits from earlier Traffic Management System deployments in GB.**			

Detailed activity planning for the DR Programme is subject to funding decisions by the DfT as laid out in their Memorandum of Understanding with Network Rail, to be confirmed through approval of whichever NPIF candidates and Route digital railway upgrade schemes are chosen to proceed to further development (as described above in section 3.2.1).

Other parts of the network where additional digital upgrades are being considered for business case development include Northern Hub, Cumbrian line, Chilterns, Merseyrail and in association with Crossrail 2. No costs are included in this plan for any of these potential candidates.

Appendix D Glossary of terms

Acronym or Term	Meaning
ASLEF	Associated Society of Locomotive Engineers and Firemen
ATO	Automatic Train Operation
C-DAS	Connected Driver Advisory System
CP	Control Period
DfT	Department for Transport
DID	Digital Initiation Directorate
DR	Digital Railway
DR Systems	Digital Railway Systems
DRACAS	Defect Recording Analysis (and) Corrective Action System
DRP	Digital Railway Programme
DRP Systems	Comprised of European Train Control System and Traffic Management System and some enabling systems (see section 3.2.2.1)
ECI	Early Contractor Involvement
ECML	East Coast Main Line
EM	East Midlands
EPMO	Enterprise Project Management Office
ERTMS	European Railway Traffic Management System
ETCS	European Train Control System
FBC	Full Business Case
FiC	First in Class
GDR	Group Digital Railway
JDG	Joint Design Group
LNE	London North East
LNW	London North West
NPIF	National Productivity Investment Fund
NR	Network Rail
OBC	Outline Business Case
RDG	Rail Delivery Group

Acronym or Term	Meaning
RIDC	Rail Innovation and Delivery Centre
RMT	National Union of Rail, Maritime and Transport Workers
SBP	Strategic Business Plan
SOBC	Strategic Outline Business case
SoFA	Statement of Funds Available
STE	Safety, Technical and Engineering
TM	Traffic Management
TMS	Traffic Management System(s)
TRU	TransPennine Route Upgrade
TSSA	Transport Salaried Staffs' Association

Appendix E Scotland Allocation

[Allocation provided by Group Finance]

At cash prices	CP6					CP6 total	CP7	
	19/20	20/21	21/22	22/23	23/24		24/25	25/26
National Cost (£m)	**36**	**43**	**58**	**34**	**21**	**192**	**0**	**0**
Scotland Cost (£m)	4	4	6	3	2	20	0	0
Scotland (%)	12%	10%	11%	10%	8%	10%	0	0
Basis for allocation to Route Business Scotland	Annual train miles							
Activity	Supporting the development of a signalling asset management plan							