

Safety, Technical & Engineering Strategic Plan



**Graham Hopkins - Group Director,
Safety, Technical and Engineering**

The railway is a complex technical system which has grown organically over two centuries. There has been a long tradition of specialist engineering and health & safety support to make this system amongst the safest in the world. Now, the devolution of Network Rail into nine separately regulated businesses, together with the considerable opportunity from new and emerging technology, drives the need for this support to be enhanced. And it is Group Safety, Technical and Engineering (Group STE) that is providing this as a strong and capable technical authority.

For the railway system to thrive, the technical authority is built around a broad scope of technical leadership including health and safety, sustainability and managing quality and information. Leading campaigns to channel the energy from across the business to change our culture as well as our knowledge. And innovating to build on 'better every day'.

First and foremost Group STE is here to support the routes to meet increasing expectations from their customers whilst keeping passengers, the public and the workforce safe. Sometimes that support is provided directly; and at other times it is through supporting other business areas including the System Operator, Infrastructure Projects and

Group Digital Railway. For much of the rail network that support means helping the routes achieve 21st Century safety and performance from what are fundamentally 19th Century assets. There are several dimensions to this. Setting frameworks to help achieve the best from people and assets and providing expert support to help that happen. Assuring the railway infrastructure is being managed in line with our frameworks and building new technical capability to transform the way our assets work. Whilst being a major force in the leading edge of international railway practice and technology development.

In Group STE we help to drive cost-competitiveness through key national programmes – the key themes in our plan. Driving intelligent infrastructure and electrical safety to improve access. Leading health, safety and sustainability on the railway to eliminate accidents and adapt to climate change. Supporting the Digital Railway programme to deliver sustainable asset costs and get more capacity from the network, contributing world class experts into the team and managing R,D&T to evolve the capability of the new train control and traffic management systems. All wrapped in a framework – an Integrated Management System - to drive Quality and Business Improvement.

It is vital that Group STE reaches out to embrace the whole railway system. We undertake wide-ranging collaborations across the rail sector and into other industries in the UK, Europe and internationally. Through these, we are building world class knowledge and new capabilities in a highly cost-competitive way by sharing the cost and risk through collaboration and building confidence to attract private sector investment. Group STE is at the heart of the opportunity from new and emerging technology. And ensuring our people have the time to focus on the areas where they can bring the most value is a priority. So to improve our timely, sustainable and efficient support to the Routes we are looking to augment our core teams with a managed services partner.

Ultimately the railway exists to drive our economic prosperity. I am proud to lead the STE Group to support our Routes to advance and exploit technical capability that will enable the railway to offer better, safer and more secure transport opportunities for passengers and freight. And to ensure the railway plays its part in the UK's industrial growth by expanding the range, and accelerating the readiness, of technologies to be taken up not just in the UK but globally. Making future train travel safer, more comfortable, more accessible, more reliable and more affordable.

Contents:	
Section 1: What is Group STE?	4
Section 2: Purpose, role, vision	6
Section 3: Objectives, Stakeholder Priorities and the Key Themes	10
Section 4: Risks, Opportunities, Constraints and Assumptions for the 10 Functional Areas	25
Section 5: Expenditure & Efficiency	40
Appendix	46

Section 1: What is Group STE?

Chief	10. Functional Areas
Chief Rail Technology Officer	Research, Development & Technology
Chief Engineer	Engineering & Asset Management
	Maintenance
	Operations Principles
Chief Quality, Health, Safety & Environment Officer	Health & Safety
	Quality
	Environment & Sustainability
Chief of Operations, Security and Information	Security
	Information Management
	Innovation



Operating Model

The way in which Group STE operates is critical to maintain and assure the safe management of the railway and build new capability to support future efficiency. Projects and services are already prioritised and resourced through a single portfolio management office and people operate through a matrix managed structure for flexibility. However, our work patterns produce significant peaks and troughs in activity. To provide the best support in the most cost-efficient way to our customers and stakeholders, and to protect the health and well-being of our people, we are investigating the feasibility of working with a Managed Services Partner.

Chief Rail Technology Officer

The Chief Rail Technology Officer (CRTO) directs the Research, Development & Technology team, underpinned by innovation, and is supported by the Engineering and Asset Management team.

The CRTO provides the vision and leadership to Network Rail's technology strategy and its contribution to the rail sector's Rail Technical Strategy Capability Delivery Plan. This technical leadership role drives the key technologies for NR and their interface with the wider railway system, directing Network Rail's technology priorities for the RTS CDP. This leadership role extends across Group STE, overseeing the quality of technical papers and the effective development of new technology proposals. And extends to providing leadership in Europe and internationally.

The CRTO leads the framing of opportunities for the GB railway to contribute to infrastructure productivity under the National Infrastructure Assessment and the UK's Government's industrial strategy. The CRTO's remit operates within a climate where Great Britain voted to leave the European Union. The focus is on considering the impact Britain's EU exit may have on standards, funding and future programmes.

Chief Engineer

The Chief Engineer includes the engineering & asset management, maintenance and operations principles functional areas.

Engineering and asset management brings together all of the company's engineering disciplines to provide engineering leadership, technical authority and manage the network's engineering capabilities to deliver a world-class railway. The team sets the engineering and technical vision, strategy, research and development requirements, policy, controls, frameworks and assurance across the technical disciplines, using engineering expertise to make today's railway better for tomorrow. The team creates the framework for the management and development of assets, technology and people; to provide engineering expertise and leadership to continually improve asset safety, performance and costs.

Chief Quality, Health, Safety & Environment Officer

The Chief Quality, Health, Safety & Environment Officer (QHSE) includes passenger and public safety, workforce safety, occupational health and well-being, ergonomics and environment & sustainability including social responsibility, quality and business improvement including lean.

The QHSE team sets the policies, strategies and standards for QHSE and manages the competencies and capabilities within the function for all of Network Rail. QHSE leads continuous improvement and drives toward excellence within the areas of quality, health, safety and environment enabling performance improvement across Network Rail. The key areas of focus are to: Save lives and protect people from being injured; keep our workforce healthy; take care of the environment; drive our social responsibility; and develop and run the Network Rail Integrated Management System and assurance programmes to enhance compliance and performance.

The team runs key national programmes through the Home Safe Plan and the Responsible Railway Plan which are owned by the business and governed by Group STE.

Chief of Operations, Security & Information

The Chief of Operations, Security and Information (COSI) includes the research, development & technology, security, information management and innovation functional areas. The RD&T function supports the Chief Rail Technology Officer to lead the management and delivery of research, development and technology: including product development and acceptance; and development and operation of the Rail Innovation and Development Centres.

The COSI team provides security leadership and governance across the Network Rail business and sets overall direction and corporate strategies for information management.

The COSI leads the provision of project management capability within Group STE so that effective governance is in place to enable successful delivery of all Group STE projects and national change programmes. Owning and managing the delivery of a programme of business change for the function, with a key focus on embedding and sustaining change and realisation of benefits. And providing project and programme reporting, analysis, forecasting and commercial management support across Group STE.

Section 2: Purpose, role, vision - 7 Key Themes

7 Key Themes **A B C D E F G**

The 7 key themes are the top level business cases that deliver value for customers. The technical leadership theme (A) ensures risks are mitigated across all the 10 strategies owned by Group STE and supporting Network Rail routes with managing performance for a safe, reliable, affordable and growing railway. Four themes (B to E) deliver enhanced capability improvement in line with customer priorities (national programmes): Digital Railway for the growing railway; Health, Safety and Sustainability for a safe railway; Intelligent Infrastructure for a reliable railway; and Electrical Safety to improve the safe efficiency of renewals for an affordable railway. A sixth theme (F) builds new technical capability that underpins the other key themes and forms a national industry programme - the Rail Technical Strategy Capability Delivery Plan; and a seventh theme (G), Driving Quality and Business Improvement, brings a new framework and tools to enhance consistency and bring improvement to the way we work across Network Rail.

A Providing Technical Leadership

Group STE is the Technical Authority for Network Rail leading policy, providing support and delivering assurance for the safe, reliable and effective functioning of infrastructure assets. Group STE serves the Routes and System Operator both directly and through the Route Services Directorate, Infrastructure Projects and the Digital Railway.

Group STE works closely with the GB rail sector to ensure the technical authority function is delivered for the whole railway system. In particular providing technical leadership including setting standards through the System Interface Committees established by the Railway Safety Standards Board and through the Technical Leadership Group co-sponsored by the Rail Delivery Group and Rail Supply Group.

Group STE collaborates with European and international railway organisations - and with technology organisations and infrastructure managers across other sectors - to share best practice, innovate and co-invest to research, develop and productionise technology applications for a better railway.

B Enabling intelligent operations through the Digital Railway

The primary focus for the Digital Railway programme is to deliver sustainable asset costs whilst switching to digital technologies to deliver targeted improvements to capacity, train performance and safety. This includes addressing the capacity challenge by the closer running of trains through digital train control and driving down the cost of conventional signalling renewals to head off a crisis of unaffordability to renew existing railway assets and to help create the headroom for investment in digital control. Support for the Digital Railway programme is focussed on the evolution of technology for use on the GB railway, in particular level 3 of the European Train Control System, traffic management and Automatic Train Operation, automated design processes and simplified conventional signalling renewals to head off a crisis of unaffordability to renew existing railway assets and to help create the headroom for investment in digital control.

Group STE will build on the foundations laid by the CP5 NR Transformation Plan



C Leading Health, Safety and Sustainability on the Railway

A safer, sustainable railway is driven through changing the way we work and the way that passengers and the public interact with the railway. It goes hand-in-hand with performance. A safer, sustainable railway is led through integrated Quality, Health, Safety and Environment (QHSE) programmes. It is delivered through being part of everyone's role, driving national programmes with the Home Safe Plan for Health and Safety, the Responsible Railway Plan for Environment and Sustainability and alongside the industry health and safety strategy 'Leading Health and Safety on Britain's Railway'.

Key Programmes are run in close cooperation with the business, unions, industry partners and other stakeholders.

D Driving Intelligent Infrastructure

Intelligent Infrastructure will improve asset management across Network Rail; eliminating failures through product and maintenance regime design and capturing, analysing and exploiting asset data to make better planning decisions about investment in our assets. Ultimately the goal is the improve the availability of the infrastructure, supporting the routes to achieve greater than 10% reduction in the level of service affecting failures in CP6. This is achieved by understanding what is likely to go wrong when and the impact a failure will have on the operational railway so we can intervene before it impacts train services.

E Driving safer, quicker access through Electrical Safety

The Electrical Safety Delivery (ESD) programme will reduce safety risks to track workers, reduce the impacts of achieving electrical isolation and improve the productivity of maintenance and renewal activities on electrified sections of the network. The programme brings together priority needs to improve the safety of our workforce and to drive down the costs of managing the railway in an environment where opportunities to access the railway are reducing.

F Building New Technical Capability through the Rail Technical Strategy Capability Delivery Plan

The railway needs to exploit Research, Development and Technology (R,D&T) to make train travel more comfortable, more accessible, more reliable and more affordable. The Rail Technical Strategy Capability Delivery Plan (CDP) provides a blueprint for R,D&T investment to develop prototype systems and equipment that will transform the railway.

The CDP underpins the delivery programme themes B to E, creating the technology demonstrators required to support new delivery programmes in CP7 and evolve the capability for future stages of the CP6 programmes. The CDP provides the means to ensure technical leadership is about creating the future as well as managing the present across all Group STE functions and make R,D&T a Business As usual activity.

[Rail Technical Strategy Capability Delivery Plan](#)

G Driving Quality and Business Improvement

Quality and Business Improvement are key enablers to avoid risks and achieve a range of strategic and tactical objectives in Network Rail. Through delivery of a modern Integrated Management System the door is opened to enhancing assurance and compliance, and hereby to drive structured Lean process optimisation. The Integrated Management System will improve compliance to Network Rail's policies, processes and standards and will positively impact QHSE and asset management performance improvements. The framework is an important enabler to Group STE's role as the Technical Authority.

The Better Every Day concept is an important part of Quality providing Lean tools, Lean leadership training, knowledge sharing and benefit management and will be closely connected to the Lean process optimisation methodology.

Network Rail's transformation plan is building the capability to deliver differently, enabling us to move from state regulated monopoly to a public sector body that acts like a private business.

We achieve this by becoming increasingly customer focused, cost competitive and commercial, change our culture and affordably create new capacity. The 7 key themes contribute to, and build on, delivering differently to create value for our customers. These contributions are summarised against the '5Cs' of the transformation plan in figure 1 (page 8).

Group STE will build on the foundations laid by the CP5 NR Transformation Plan



Figure 1: Contribution of the 7 key themes to the transformation agenda '5Cs

		Customer Focused	Cost Competitive	Commercial	Culture	Capacity
Providing Technical Leadership	Impact from CP6	✓✓	✓	✓	✓✓✓	✓
Enabling Intelligent Operations through the Digital Railway		✓	✓	✓	✓✓✓	✓✓✓
Leading Health, Safety and Sustainability on the Railway		✓✓✓			✓✓✓	
Driving Intelligent Infrastructure		✓	✓✓✓		✓✓✓	✓✓
Driving safer quicker access through Electrical Safety		✓✓	✓✓✓		✓✓✓	✓✓
Building new capability through the Rail Technical Strategy Capability Delivery Plan		✓	✓	✓✓✓	✓✓✓	✓
	Impact from CP7	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Driving Quality and Business Improvement	Impact from last year of CP5	✓✓✓	✓✓✓	✓	✓✓✓	

Figure 2: List of main components of the Group STE Strategic Plan

7 Key Themes (the top level business cases that deliver value for customers)	10 Functional Areas (driving 10 strategies that frame delivery under the 7 key themes)	12 Accountabilities (of Group STE as the Technical Authority)	3 Stages of Our Life Cycle (that delivers value for customers)
Providing Technical Leadership	Research, Development & Technology	1. Overall direction and corporate strategies	Build New Technical Capability Accountabilities 1 • 2 • 3 • 5 • 9
Enabling intelligent operations through this Digital Railway	Engineering & Asset Management	2. Management systems, policies, standards, processes	
Leading Health, Safety and Sustainability on the Railway	Maintenance	3. Information Management and Technology systems	
Driving Intelligent infrastructure	Operations Principles	4. National Improvement Programmes	Set Frameworks & Deliver Support Accountabilities 1 • 2 • 3 • 4 • 6 • 10 • 11 • 12
Driving safer, quicker access through Electrical Safety	Health & Safety	5. Research, Development, Technology & Innovation	
Building new technical capability through the RTS Capability Delivery Plan	Quality	6. Performance monitoring, modelling, analysis, benchmarking & continuous improvement	
Driving Quality and Business Improvement	Environment & Sustainability	7. Level 2 Assurance	Provide Assurance & Improvement Accountabilities 1 • 2 • 3 • 7 • 8 • 9
	Security	8. Intelligence from Assurance & Investigations	
	Information Management	9. Capability & Competency Development	
	Innovation	10. Skill Pool Health & Recruitment	
		11. Point of contact for regulatory, government and industry bodies	
		12. Expert Services	

Figure 3: Relationship between main components of the Group STE Strategic Plan

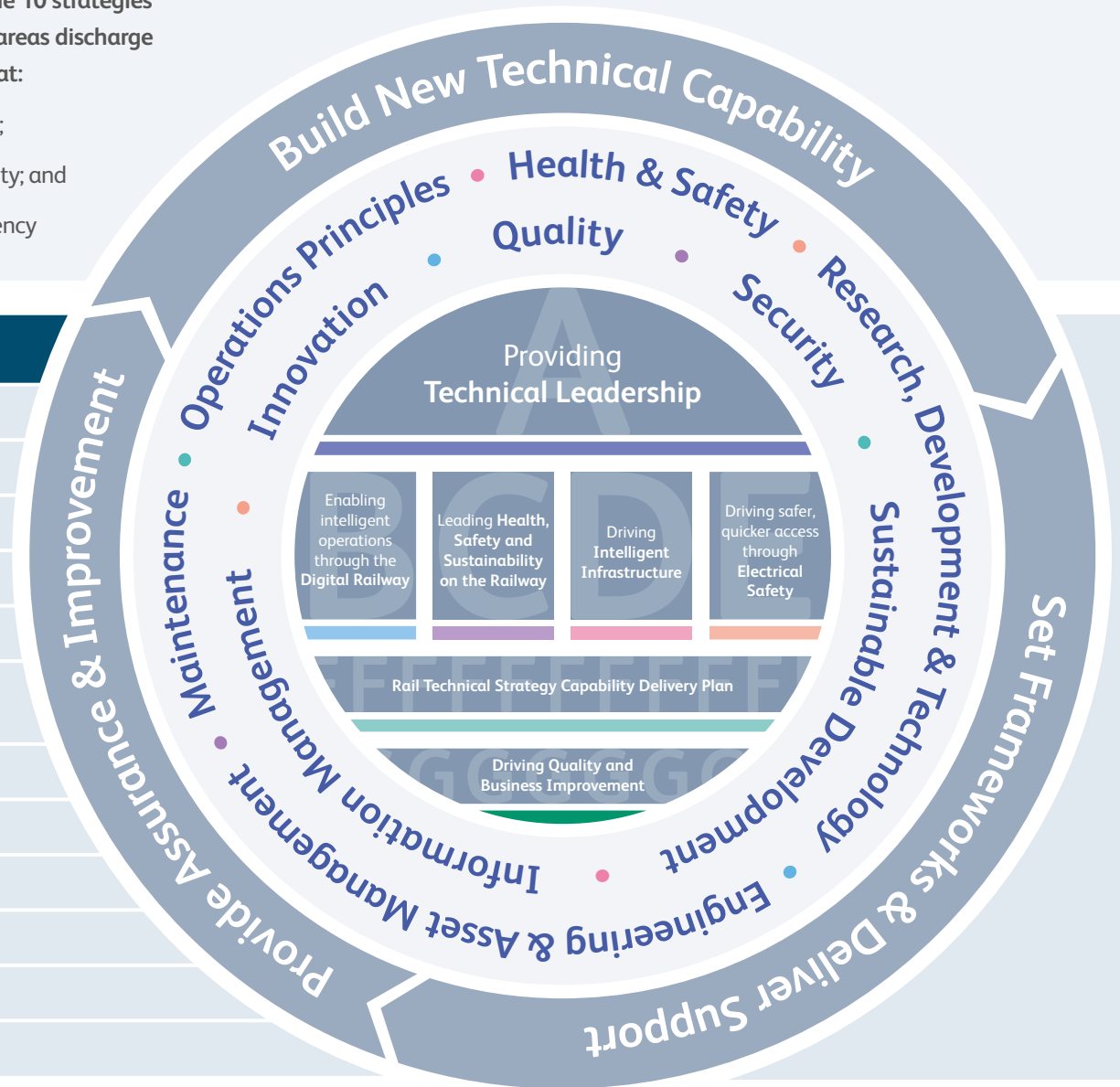
How are the key themes delivered?

Group STE delivers value through the 7 key themes. This is driven by the 10 strategies each of which is aligned to one of 10 functional areas. The functional areas discharge the 12 Group STE accountabilities within an improvement life-cycle that:

- Builds new technical capability through development and prototyping;
- Sets frameworks and delivers support to productionise technical capability; and
- Provides assurance and improvement to ensure compliance and efficiency

The role of the Technical Authority - 12 accountabilities

1.	Overall direction and corporate strategies
2.	Management systems, policies, standards, processes
3.	Information Management and Technology systems
4.	National Improvement Programmes
5.	Research, Development, Technology & Innovation
6.	Performance monitoring, modelling, analysis, benchmarking and continuous improvement
7.	Level 2 Assurance
8.	Intelligence from Assurance & Investigations
9.	Capability & Competency Development
10.	Skill Pool Health & Recruitment
11.	Point of contact for regulatory, government and industry bodies
12.	Expert Services



Section 3: Objectives, Stakeholder Priorities and the Key Themes

Understanding Stakeholder Priorities

Group STE operates to the Business Management Performance Framework (BPMF) which is our vehicle for driving continuous improvement in our overall performance. This is achieved through four components; a clear understanding of our roles and accountabilities, a robust framework of performance meetings, performance measures and reports, and demonstration of the Network Rail behaviours. As such, the BPMF provides the framework against which stakeholder priorities for future expenditure are understood.

For the Chief Engineer the insight from stakeholders is achieved through integration meetings with stakeholders including asset managers and directors from the route businesses and engineering directors from IP. Priority actions are informed from the level 2 risk assurance review and Chief Engineer assurance review meetings to focus on the top 5 issues for each professional head and from assurance data and trends. At executive level, this is driven from the Business Assurance committee.

For the Chief Quality, Health, Safety & Environment Officer, stakeholder insight for safety, health and environment is provided through feedback from the periodic Route Operations and IP business reviews, the Integration Review Group and from the National Health, Safety & Welfare Council (attended by Trades Unions health and safety representatives). The quarterly National Safety, Health and Environment Review Group (NSHERG) meeting, attended by senior functional representatives is responsible for endorsing policies, strategies and plans to manage safety, health and environment risks and opportunities. The periodic Safety, Health & Environment (SHE) Integration Review meeting, attended by Route and IP heads of SHE provides a forum for engaging with the SHE community across the business. Priority actions are informed by the review of the Safety, Health and Environment Performance (SHEP) report including key SHE KPIs and metrics, 'deep dives' into specific safety, health and environment risk themes, and the findings from assurance activities which are also considered at the Business Assurance Committee. Stakeholder insight for quality is provided through the quarterly Quality & Continual Improvement Board.

For the Chief of Operations, Security and Information priority actions for security are informed by the Route Security and Resilience Councils and through the enterprise risk

Business Assurance Committees, along with KPI and incident reporting from Network Rail's Fusion unit within the British Transport Police. In addition to the Network Rail Routes, DfT as the railway security regulator and the Train Operating Companies are significant stakeholders in railway security. Their priorities are informed through the regulations set out in the National Railways Security Programme, formal Security Risk Assurance Matrices, owned by DfT and developed cross industry, and by the industry Policing and Security Group and the National Railway Security Council.

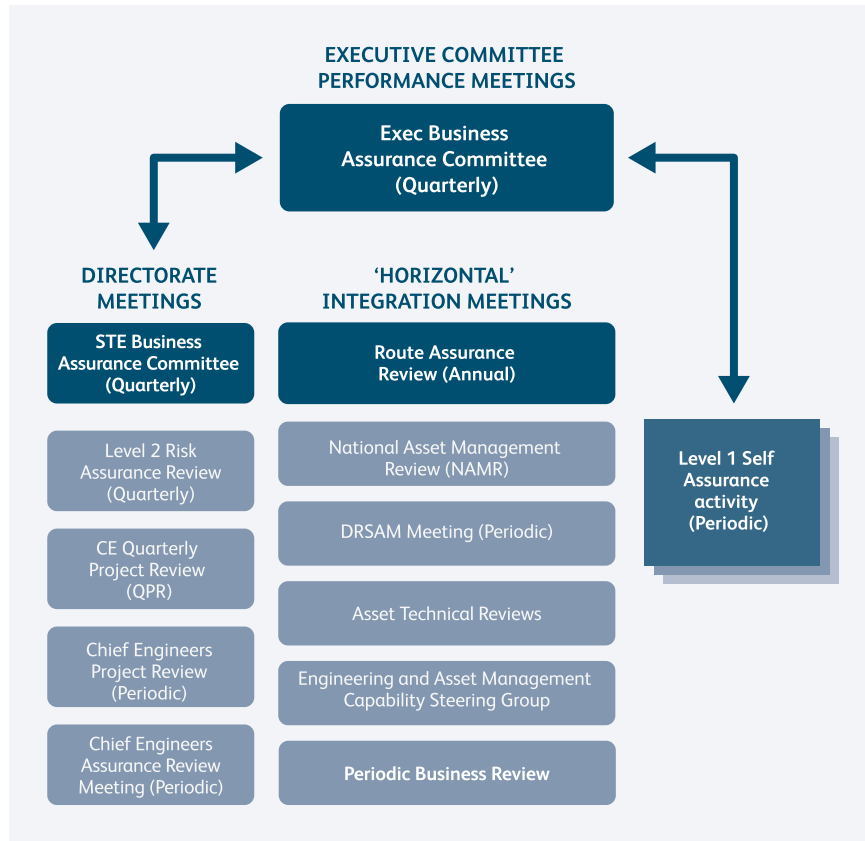
The Chief Rail Technology Officer has established R,D&T priorities with industry at a whole railway system level. That governance is set out in section 3 under "Building new capability through the RTS Capability Delivery Plan" and is operating in shadow mode in preparation for business as usual operation in CP6. Priority requirements for R,D&T are developed and steered under a Research & Technology Board with stakeholder and customer representation including the routes, IP and Digital Railway. The R,D&T requirements have been developed across most asset areas and are articulated and published as challenge statements. These are being integrated into the single industry R,D&T plan for CP6.

Priorities are implemented, managing the risks and opportunities for which NR is accountable, through panels with customer and stakeholder representation that:

- Priority score all investment opportunities against a framework that takes into account corporate priorities, route priorities, indicative return on investment and deliverability;
- Steer the development of investments through a Product Development framework
- Authorise investments

We have engaged heavily with the National Infrastructure Commission to shape the development of the National Infrastructure Assessment, the Rail Supply Group to develop a Sector Deal proposal to the Department for Business, Energy and Industrial Strategy and the Department for Transport to support its Strategic Vision for Rail published 29 November 2017.

Figure 4 – Chief Engineer stakeholder engagement for setting asset policy, delivering support and providing assurance.

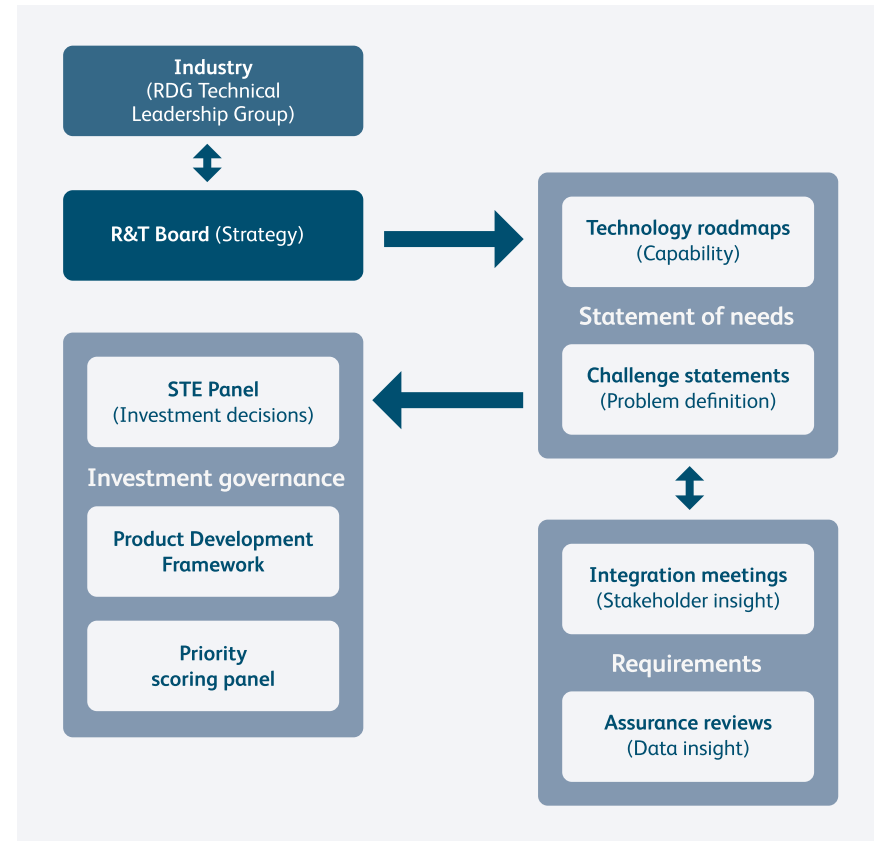


Delivering Stakeholder Priorities

Stakeholder priorities are established under the 7 key themes as three types of activity:

- The technical leadership theme (A) ensures risks are mitigated across all the 10 strategies owned by Group STE. These in turn mitigate risks to the wider business and industry enabling the delivery of benefits to the railway. A summary of the risks managed by Group STE and the risks managed by the wider business is shown at Appendix C. The other key themes reflect investment to enhance our mitigation of risk and opportunity areas of particular importance to our stakeholders.

Figure 5 – Chief Rail Technology Officer stakeholder engagement for building new capability through R,D&T



- The four themes (B to E) deliver enhanced capability improvement in line with stakeholder priorities (national programmes): Digital Railway; Health, Safety and Sustainability on the Railway; Intelligent Infrastructure; and Electrical Safety.

- The sixth theme (F) builds new technical capability that underpins the other key themes and forms a national industry programme - the Rail Technical Strategy Capability Delivery Plan - that has been formulated by the industry.

- The seventh theme (G), Driving Quality and Business Improvement, is a key enabler across many risks to enhance consistency and bring improvement to the way we work across Network Rail.

Providing Technical Leadership



Technical leadership is at the heart of Group STE's role as the technical authority. Group STE will drive excellence as a technical authority through CP6, characterised by sustainable best in class performance; exploiting CP6 technology development; and being recognised for excellence.

The vision will be delivered through the 10 functional areas by:

- Leading the management and delivery of Network Rail's R,D&T and innovation strategies in line with the RTS CDP
- Setting overall direction and corporate strategies for the functional areas of the technical authority through setting frameworks
- Assuring the capability and competence of our people and plan and manage the health and vitality of the skill pool
- Providing assurance for completeness and compliance with systems and controls for the functional areas of the technical authority
- Leading reporting, analysis, forecasting and performance benchmarking across NR to uphold quality, continuous improvement and sharing of best practice through excellent knowledge management

- Driving continuous improvement through modifications to processes, competencies, tools and technology to include challenging current standards and policies to ensure best value for money. Providing organisation-wide lean leadership.

Specific outcomes and measures for the 10 functional areas are shown in Figure 3:

An example of a key assurance framework is for health and safety. Group STE sets the health and safety assurance framework for the organisation and delivers the following level 2 assurance:

- Functional audit programme
- Engineering verification
- Principal Contractor licensing
- Plant operating scheme (POS) audits (jointly with RISQS)

Learning from assurance

A quarterly analysis of assurance outputs and of the key points from the analysis and review of level 1 assurance activity outputs is led by Group STE and reports into the National SHE Review Group.

With support from Group STE, each route is developing plans to improve the collation and analysis of the outcomes from their assurance activities.

Learning from incidents

Group STE defines the policy, procedures and competence arrangements for reporting and investigating all safety events across the company. These events are investigated according to their potential to cause harm.

A fair culture policy sets out how safety investigations will be undertaken in conjunction with the relevant Trades Unions. Recommendations to improve policy, procedures, competence arrangements and technology improvements are reviewed at a national level and allocated to lead managers to progress.

Risk management maturity model (RM3)

By leading use of the Risk Management Maturity Model (RM3), Group STE helps the business identify strengths and areas needing structured continuous improvement



Figure 6 - Outcomes and measures for the 10 functional areas

Benchmarking to improve

Group STE is pursuing a clearer understanding of leading thinking and best practice through a programme of benchmarking. This enables NR to identify, assess and implement practices, processes, technologies and competencies from other organisations to improve performance. We are continuing to develop and improve NR’s capability in benchmarking, lateral learning and continuous improvement and supporting the delivery of organisation-wide lean leadership. This includes identifying opportunities to change current standards and as we encourage the industry to challenge our standards, as we committed following the review by Professor Peter Hansford, to help us deliver better value. An example of benchmarking in action can be seen with the changes we have already brought about, with further improvements in hand, to our process for accepting new products on to the railway.

We will continue to establish the most relevant comparator organisations through involvement in industry forums, and established work with professional institutions. This includes work with international railways, and UK infrastructure providers. Of particular importance is how to gain greater value from information - we will continue to consider the emerging guidance on Building Information Modelling as a key reference source.

		Outcome	Measure	Customers	Customers engaged through:
Chief Rail Technology Officer	Research, Development & Technology	Maximise exploitable value of new technology from single, industry-wide R,D&T strategy (the RTS CDP)	R,D&T managed within RTS CDP governance	Route Businesses, System Operator, IP, Route Services, Digital Railway, Group STE	Facilitating the development and publication of challenge statements Engagement through prioritisation of investment and product development framework
Chief Engineer	Engineering & Asset Management	Improve maturity in asset management including optimal decision-making	ISO 55001 alignment, AMEM score, Asset Data quality score, Service affecting failure	Route Businesses, IP, Digital Railway, Group STE	PBR, HoMD periodic meeting, Intelligent Infrastructure governance group Periodic Business Review, National Asset
	Maintenance	Maintenance delivered efficiently and effectively with service affecting failures trending to zero	Opex reduced by 2.5%, reducing Service Affecting Failures	Route Businesses, IP, Digital Railway, Group STE	Management Review, Asset Technical Reviews & Engineering Strategy Meeting. Suppliers
	Operations Principles	Reduce train accident risk and contribute to reduced DPI through increased operational control	Operational close calls Delay minutes	Route Businesses, IP, Route Services, Digital Railway, Group STE	Engineering Directors forum, Rail Delivery Group & National Task Force (the train operators Group)
Chief of Quality, Health, Safety and the Environment	Health & Safety	Improve maturity in health and safety risk management and achieving Everyone Home Safe Every Day and Everyone Fit for the Future.	RM3 score, Health & Safety KPIs	Route Businesses, IP, Route Services, Digital Railway, Group STE	Route Operations and IP business reviews, Integration Review Group, National Health, Safety & Welfare Council, Quality & Improvement Board
	Quality	Stronger systems through integrated management, better assurance and structured improvement.	Employee Engagement, Compliance / Non-Conformance levels, Improvement Capability level	All Network Rail Businesses, All Suppliers, ORR.	
	Environment & Sustainability	Improved maturity in measuring and managing environmental and social risks, and increased socio-economic benefits to local communities	Lineside neighbour complaints, ISO 14001 and ISO 50001 alignment, progress towards zero emissions, E&SD KPIs	Route Businesses, IP, Route Services, Digital Railway, Finance, Property.	
Chief of Operations, Security & Information	Security	Reduced losses from security incidents through a formal systematic approach	Level 1 security risks, Departmental Security Health Check (DSHC), DfT inspection report, KPI reporting	Route Businesses, IP, Route Services, HR, Digital Railway, Group STE	Establishing formal governance structures and a management system that provides clear roles and accountabilities
	Information Management	Improve maturity in information governance through lean process	Information Maturity Assessment, Information Asset Register	All Network Rail Businesses, All Suppliers, ORR, RSSB, DfT, Value from Data work package	DJISIC, Industry Senior Information Risk Owner group, Information Steering Committee.
	Innovation	Improve pace, ambition and engagement with ideas to action as part of a high performance culture	Innovation Maturity Assessment	All Network Rail Businesses, All Suppliers, TLG, CDP, Group STE Investment Panel	Innovation Leadership Group, RD&T Board, Innovation Community of Practice

Enabling intelligent operations through the Digital Railway

The primary focus for the Digital Railway programme is to deliver sustainable asset costs whilst switching to digital technologies to deliver targeted improvements to capacity, train performance and safety. It achieves this by combining the application of digital technology with innovation in supply chain relationships and alignment of delivery plans with the franchising programme.

Digital train control is at the heart of the digital technologies that are expected to deliver the targeted improvements, drawing on key capabilities from the Rail Technical Strategy Capability Delivery Plan, in particular address the capacity challenge by the closer running of trains through digital train control. Group STE's support for the Digital Railway programme is built around four strands that form, and are funded as, an integral part of the Rail Technical Strategy Capability Delivery Plan and include:

1. Developing an Enterprise Architecture and Data Architecture framework to develop the alignment of business and technology and its ability to address formalisation of system requirements.
2. Developing and demonstrating digital train control technologies, including traffic management to improve train performance by improving conflict prediction and enabling of real-time re-planning of timetables; and automatic train protection systems, to dramatically reduce the separation between trains without compromising safety;

3. Automating design processes; and
4. Driving down the cost of conventional signalling renewals to head off a crisis of unaffordability to renew existing railway assets and to help create the headroom for investment in digital control.

Areas where digital train control technologies require development and demonstration include:

- Creating a facility for whole system modelling and analysis to support a new concept of operations
- Building a whole system safety case that establishes safety principles to facilitate a new concept of operations
- Demonstrating high performance braking systems, and building predictability with existing braking systems
- Developing and demonstrating how to exploit technologies to increase accuracy of positional information and directly measure the gap between trains
- Demonstrating dependable command, control and communications systems and equipment to provide continual real-time information on location, speed and direction of travel

- Demonstrating Connected-DAS implemented with intelligent traffic management, including developments to manage the Human Machine Interface, to achieve better train operation and release additional train paths
- Demonstrating steps in achieving Automatic Train Operation

Lower cost signalling renewals will directly address the current renewals unit cost for future Control Periods but more significantly address the challenge in CP7 where the volume of renewals rises substantially and is likely to exceed a sustainable funding level. This work will build on the European collaboration undertaken in CP5 with 9 other rail infrastructure managers – the EUlynx collaboration programme - to reduce dependence on proprietary signalling systems and equipment.

Additionally there are broader connections with the capabilities being developed under the Rail Technical Strategy Capability Delivery Plan. These contributions include: Work to better plan a timetable and regulate the traffic; and developing traffic management technologies. These are contributions towards key capabilities set out in the RTS Capability Delivery Plan *minimal disruption to train services, more value from data* – including real time personalised information about journeys - *optimum energy usage and services timed to the second*.

Leading Health, Safety and Sustainability on the Railway



A safer, sustainable railway is driven through changing the way we work and the way that passengers and the public interact with the railway. It goes hand-in-hand with performance. A safer, sustainable railway is led through integrated Quality, Health, Safety and Environment (QHSE) programmes and is delivered through being part of everyone's role.

The Home Safe Plan for Health and Safety and the Responsible Railway Plan for Environment and Sustainability is the way in which Network Rail drives continuous improvement and delivers the company Health, Safety and Environment Strategies alongside the industry strategy 'Leading Health and Safety on Britain's Railway'. The plans comprise a portfolio of short and long term programmes and projects that impact at individual, local and national levels. Plans are selected, in collaboration with the business and unions, based on risk versus cost to prioritise the most HSE benefits for our passengers, the public, our workforce, the environment and the communities surrounding our infrastructure. The Home Safe Plan and the Responsible Railway Plan are being driven from the central QHSE team and co-owned with the business.



Key targets under this investment are to:

- Build on the forecast 15 % reduction in risk to the public at level crossings in CP5 by targeting a further 5 % reduction by the end of CP6.
- To reduce mental health related sickness absence by 30 % from the CP5 exit baseline.
- Reduce non-traction energy consumption by 18 % to achieve a 25 % reduction in the rate of CO2 emissions by the end of CP6.

Monitoring and reporting of performance is to a defined 'drum-beat' of meetings with clear roles and responsibilities identified.

Key projects in the Home Safe Plan and The Responsible Railway Plan for CP6 are:

1. Level Crossing Risk Reduction
2. Safer Trackside Working
3. Manual Handling
4. Suicide Prevention
5. Fatigue Risk Management
6. Weather Resilience and Climate Change Adaptation
7. Integrated Management System
8. Mental Health and Resilience

Reducing the risks of Trackside Working

The Safer Trackside Working Programme supports Network Rail's ongoing target to reduce the risk of track workers being struck by a train. It supports the Track Worker Safe Access Strategy, which is a phased risk reduction strategy delivered through the design, development and deployment of new higher integrity protection and warning systems.

Benefits from the Safer Trackside Working Programme are being realised in phases commencing with initial deployments of tactical solutions in CP5 to give some early reduction of risk. The second wave of benefit will be realised through deployment of further tactical solutions during CP6 and a third phase of benefit will start to be realised when strategic solutions are deployed as part of the deployment of digital train control technologies under the Digital Railway programme.

Leading proactive fatigue risk management in the rail industry

Fatigue presents one of the most widespread risks throughout the rail industry, with the potential to affect everyone regardless of role and location. Consequences can impact workforce, operational and public safety. Group STE will provide processes and systems to support better understanding and management of fatigue risk. The introduction of a new standard that reflects the needs of the industry is the starting point, adopting best practice from recent successful standard implementation and supported by the provision of tools and guidance on fatigue risk assessment and rostering.

Manual handling

Learning from other process and service industries and driven by number of incidents caused by manual handling it is key to this programme that risks are identified and mitigated for all manual handling activities.

Vehicles will have to be adapted to avoid higher risk handling tasks. We have invested significantly in CP5 to better understand the significant risks, to develop and adopt practical solutions. In CP6 our focus will be on deploying safer equipment, better handling aids and more integrated solutions that reduce handling risks.

The Integrated Management System (IMS)

The IMS will provide one operating framework to deliver better governance and support process-based improvement. The IMS will provide clear conformance to core external standards such as ISO55000 (asset management), ISO9001 (quality management), ISO14001 (environmental management) and ISO45001 (occupational health and safety); and key legislation. The IMS process architecture will clarify accountability across Network Rail, and establish the responsibility of process owners, as an enabler for integration of our methods and the terms of devolution.

The IMS will be available to employees and interested parties through a new IT solution making it easier and more efficient to find supporting information such as work instructions, templates and procedures. The IT solution will be designed to ensure it is easy to use, resilient, up to date and available across multiple devices with real time information.

Suicide prevention

Around 250 people choose the railway each year to take their own life. The impact on their families and the railway staff involved at the scene is devastating; and the impact on passengers through train delays is disruptive and costly. Group STE manages an industry-wide world-leading programme, working collaboratively with external partners

that has a track record of significantly reducing railway suicides, providing performance and wider societal benefits.

The CP6 programme extends proven interventions work and engaging with local health authorities and charities to further reduce the numbers of suicides. Campaigns will continue to extend the reach of interventions to the wider travelling public. The CP6 programme will also deliver further targeted deterrents such as fencing and patrols in areas with most incidents.

To supplement the planned suicide prevention strategy, we will work with the Samaritans to deliver a million hours of volunteering across the railway industry in a “Million hours challenge”. We want to make sure that all railway staff are more aware of volunteering opportunities, want and know how to volunteer and are more easily able to volunteer for the Samaritans, so that a million hours of volunteering takes place over five years across the railway industry. We will also work with the Samaritans to make it easier for Network Rail and wider industry colleagues to volunteer.

Level Crossing Risk Reduction

Accidental deaths and injuries are now prevented, and the opportunity for access for trespass or deliberate self-harm are reduced, at 1100 closed level crossings. In CP6 level crossing risk reduction will move from focussing on level crossing closures to adopt an ‘As Low As Reasonably Practicable’ risk-based approach. This will be efficiently achieved by deploying technology developed in CP5. Deploying active warning systems, avoiding communication errors, helping users take good decisions and deterring deliberate misuse will sit at the heart of the CP6 strategy. Development and deployment of a solution mitigating risk at the highest risk half-barrier crossings will be part of the programme. Encouraging responsible use will be achieved through education, communication and enforcement campaigns including further targeted roll out of technology and our continued partnership with the British Transport Police.

Weather Resilience and Climate Change Adaptation



Adverse and extreme weather conditions significantly impact railway safety, reliability and performance, causing on average 1.5 million delay minutes per year as well as societal costs. The Weather Resilience and Climate Change Adaptation (WRCCA) programme will embed future weather consideration into business planning and asset management processes from CP6, increasing the resilience of the railway and reducing the safety, performance and cost impacts from weather events.

This will be achieved by integrating WRCCA requirements into asset management frameworks and Route Adaptation plans and providing WRCCA guidance and expertise to decision makers.

Mental Health and Resilience

Mental health continues to be the second highest reason for sickness absence within Network Rail and is recognised to be a huge impact for the UK economy. At Network Rail we have on average 40,000 lost absence days per year for mental health conditions with costs arising from absenteeism, presenteeism and staff turnover.

In CP6 we will continue to drive forward the deliverables and benefits of a Mental Health and Resilience project to address the stigma associated with mental health, the high levels of sickness absence and ensure that all staff have the necessary tools and information to provide the correct support to those that are suffering with psychological conditions.

Driving Intelligent Infrastructure



The Intelligent Infrastructure programme is driven by an urgent need to improve asset management across Network Rail; eliminating failures through product and maintenance regime design and capturing, analysing and exploiting asset data to make better planning decisions about investment in our assets.

Ultimately the goal is to improve the availability of the infrastructure, supporting the routes to achieve greater than 10% reduction in the level of service affecting failures in CP6 by:

- Understanding the probability of individual asset failure
- Predicting when failure will occur
- Forecasting the impact on the operational railway
- Planning intervention prior to disruption to train services

Safety improvements will be delivered alongside the performance improvements, with the introduction of more effective work planning, reducing the exposure of staff to the operational railway.

The programme will apply Research, Development and Technology to improve existing capabilities, especially in the areas of monitoring assets, 'big data' analytics and work planning. This will be achieved by:

- Rationalising the approach to Intelligent Infrastructure activities and implementing a consistent, network wide operating model
- Embedding reliability engineering into products and maintenance regimes
- Optimising embedded monitoring coverage
- Evolving train-borne monitoring
- Maintaining existing vehicle monitoring capability
- Transforming analysis and analytic capability
- Exploiting information systems, making Ellipse the core of all asset management activity
- Industrialising autonomous systems

The programme is an evolution of several work streams initiated in CP5 which are brought together in a single integrated business transformation programme.

It rationalises infrastructure condition monitoring and decision support improvement activities including:

- Embedded monitoring, Plain Line Pattern Recognition, Eddy Current, Corporate Rostering and rack Integrated Geometry Engineers Reports (TIGER);
- All other train borne monitoring improvement and renewals activity
- Ellipse Exploitation
- Maintenance Planning
- Predict and Prevent analytics demonstrators
- ORBIS Decision Support Tools and Mobile Works Manager

The programme continues to be defined, proofs of concept developed and delivery arrangements put in place which is assumed to complete by the end of CP5.

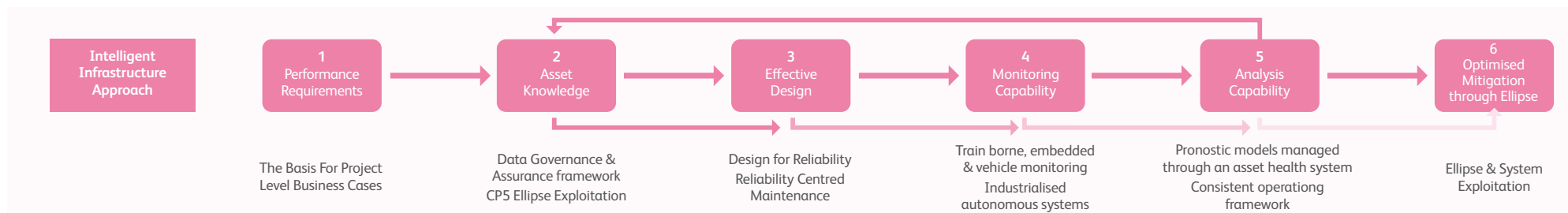
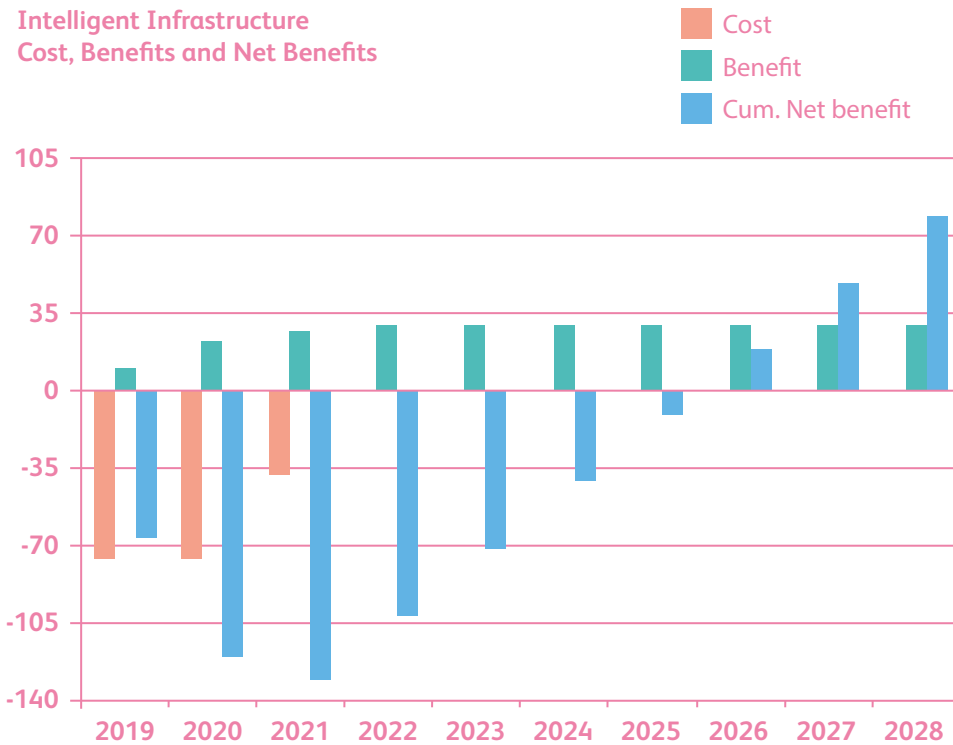


Figure 7: expenditure and benefit for Intelligent Infrastructure



Driving safer, quicker access through Electrical Safety



The Electrical Safety Delivery (ESD) programme forms part of the Home Safe Plan and is driven by an urgent need to mitigate the Level 1 electrical power risk “Failure to deliver and implement an effective electrical system management framework leading to a serious safety incident, non-compliance to legislation, prosecution and significant rise in programme costs.” ESD was endorsed by NR’s Executive Committee in February 2015.

ESD aims to reduce safety risks to track workers, reduce the costs and impacts associated with achieving electrical isolation and improve the productivity of maintenance and renewal activities on electrified sections of the network. The productivity gained through the implementation of ESD initiatives is an average time saving of 40 mins per possession. The programme brings together priority needs to improve the safety of our workforce and to drive down the costs of managing the railway in an environment where opportunities to access the railway are reducing.

The ESD programme spans CP5 and CP6. In CP5, investment is focussed on installing assets to help improve compliance with the Electricity at Work Regulations (EaWR) and improve electrical safety on the DC electrification system. In CP6 the ESD programme will build on trials carried out during CP5 on the 25kV AC electrification system. It will install or renew remotely controlled and electronically secured assets that will reduce electrical safety risk, improve compliance and improve the efficiency of taking electrical isolations. The spend and benefits profile are shown in figure 8; and the change in capability, route by route, is shown in figure 9.

ESD Provides 50% reduction in electric shock risk specifically:

- Eliminating, or reducing the use of, AC earthing straps and DC shorting straps which are high-risk with life threatening consequences; and
- Reducing the need for work to be undertaken with overhead of third rail electrical conductors live through the ease and speed of isolations

Marginal benefits are also available from reductions in incidents from manual handling and road traffic accidents.

The benefits are clear when viewed in the light of challenges facing a route. Wessex faces substantial challenges that can be unlocked through ESD. Risk issues when accessing the infrastructure to carry out isolations including contact with electricity, contact with trains, slips, trips, falls and manual handling and driving. Performance issues from a backlog of maintenance and renewals and train service affecting failures. And productivity issues from restrictive mid-week night access windows, insufficient working time to complete tasks in one shift, constraints from the need to maintain a core overnight freight service to Southampton. ESD offers solutions which are summarised in figure 10.

Figure 8: expenditure and benefit for ESD

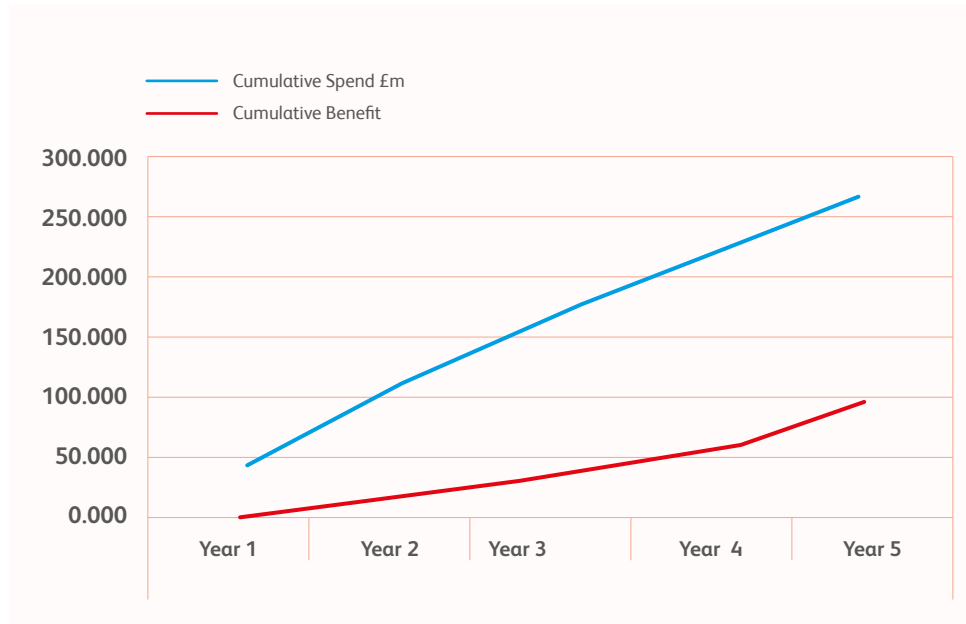


Figure 10: summary of solutions offered by ESD

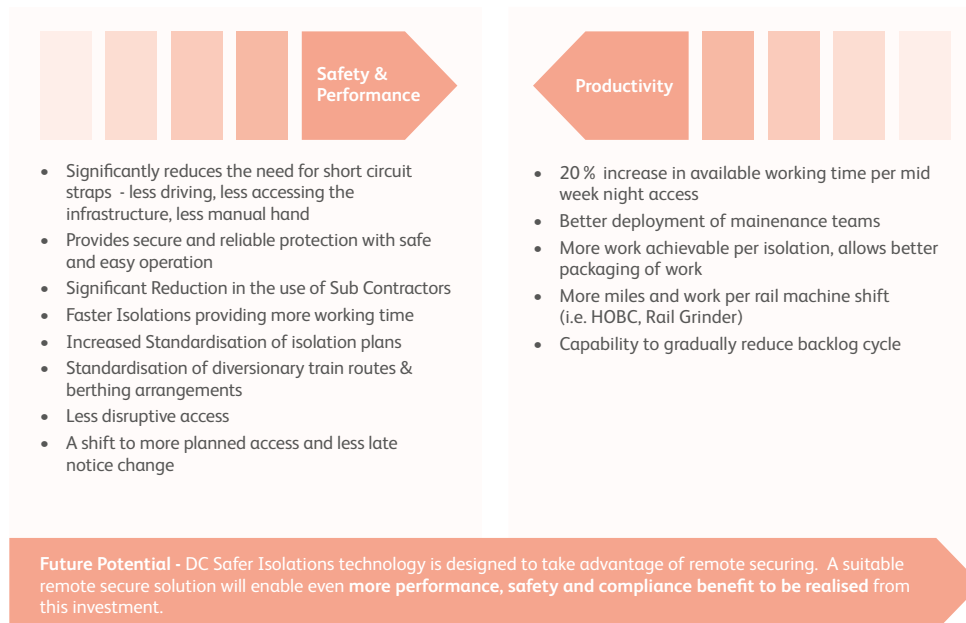
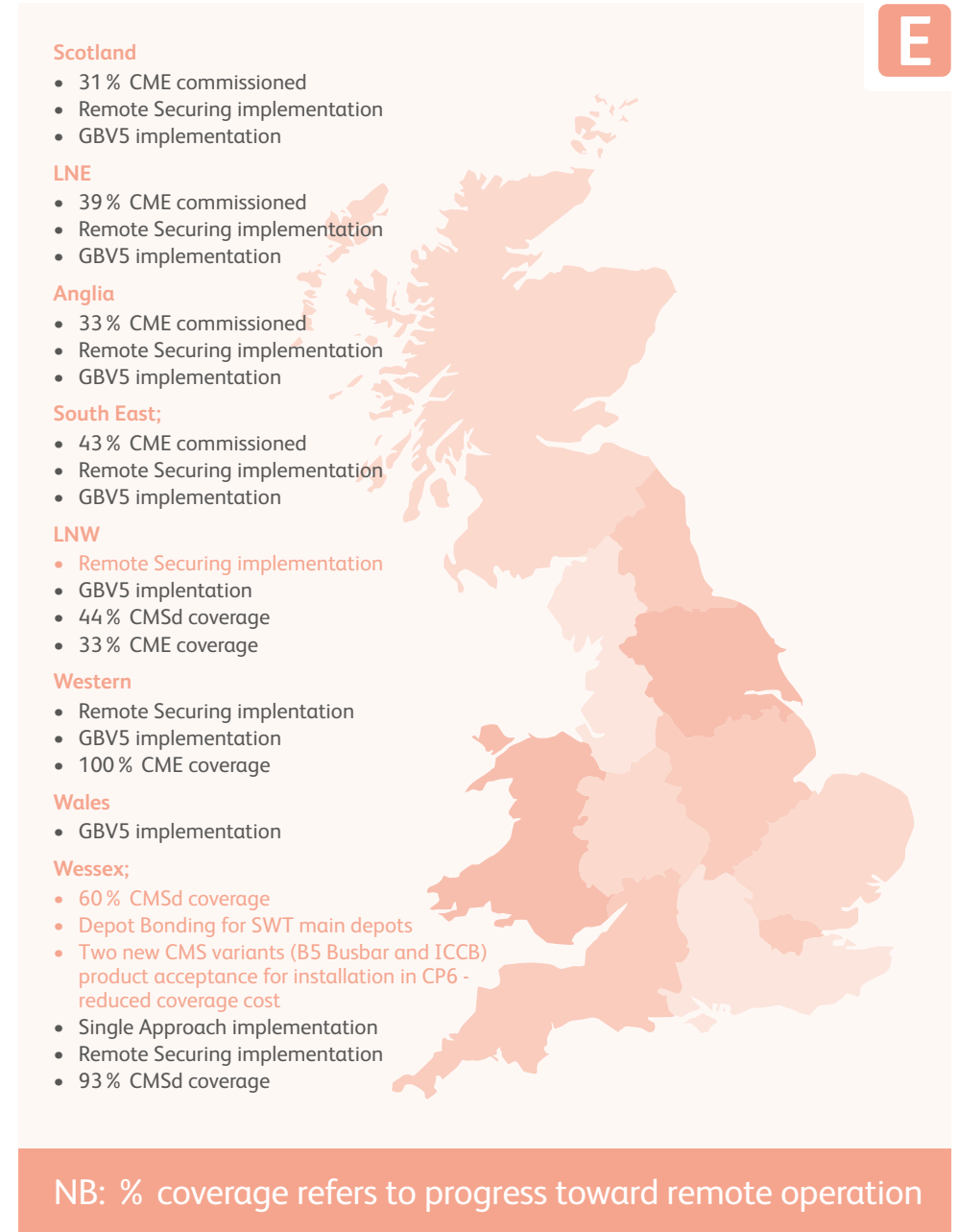


Figure 9: status of ESD



Building New Technical Capability through The Rail Technical Strategy Capability Delivery Plan



The first Rail Technical Strategy (RTS) was published by government in 2007 setting out a 30 year vision for GB rail and the technology development required to get there. In 2012 it was revised and updated to reflect the rail industry taking ownership of the strategy from Government and an initial pipeline of R,D&T projects and innovation activity established in CP5.

The challenge of shifting a sector that invested very little in R,D&T to one where R,D&T drives productivity and performance has been immense. However, the industry is now on track to step up to the level of investment required to meet the expectations for a heavily technology-dependent sector and to meet the long term goals of transforming the customer experience, halving unit costs, doubling capacity and halving carbon.

January 2017 saw the Rail Technical Strategy Capability Delivery Plan (CDP) published as an integral part of the rail industry's advice to the Secretary of State for Transport. This single plan provides a baseline - or blueprint - against which the urgency and value of any R,D&T activity across the industry can be understood. Providing a link between R,D&T projects and capabilities built around clear advances in the way the railway could

function in the future. It sets out the steps and priorities as to how industry will collaboratively deliver the RTS vision, taking a whole system approach. The CDP divides the RTS into 12 capabilities; 11 technical and 1 cultural, that we need to deliver in order to realise the RTS vision.

Effective governance for the CDP is vital. A comprehensive system of governance has been established, and is being operated, to build on approaches tested in CP5 and to directly address the lessons from advancing early projects. The governance comprises ways of working together with a structure of accountability. The ways of working recognise and assure progress through two so-called 'valleys of death' where R,D&T projects can stall [shown in fig 12]. Progress is assured by systematically managing risk and opportunity through readiness frameworks; delivering at pace through accelerators; and prioritising investment through a priority scoring framework.

High level planning is underway to identify the major technology demonstrators [examples are shown in the 4 photos] that will be developed in CP6 and which are estimated to deliver exploitable value of around £1.3Bn per annum by the end of CP6.

These plans embrace the development work underway through the Shift2Rail programme; the ambitions set out through the challenge statements and technology roadmaps developed across the infrastructure assets; and challenges from across the whole railway system.

The CDP was developed with broad industry engagement and has been endorsed by the Rail Delivery Group (RDG) and Rail Supply Group (RSG). The Technical Leadership Group (TLG), a cross industry body reporting to the RDG and chaired by Network Rail's Group Director for Safety, Technical and Engineering, has been appointed and is accountable for the delivery of the CDP across the whole industry.

A cross industry programme team has already been formed reporting to TLG. The programme team consists of a central programme support team (engine room) and Work Package Owners (WPO's). The central programme team are made up of Network Rail and RSSB staff who are providing support to the WPOs. The WPO's are drawn from organisations across the industry. They own the plans and are accountable to TLG for delivering the 12 capabilities outlined on the CDP.

[Rail Technical Strategy Capability Delivery Plan](#)



Trains that don't require tracks



A virtual travel concierge



Independent non-diesel power



Robotics to additively manufacture

Figure 11 - first in class deployments of system level demonstrators



Figure 12: ways of working to assure progress through two 'valleys of death'.

		Ways of working		
		Managing risk & opportunity	Delivering at pace	Prioritising investment
Assuring progress through two 'valleys of death'	Development to technology demonstration (RIRL4-6)	Product development framework	UK Rail Research & Innovation Network (accelerate tech demonstrators)	Priority scoring framework (strategic fit, return on investment)
	Readying the market and commercialising (RIRL7)	Enablers (route to market) framework	Commercial accelerator	Priority scoring framework (deliverability)

Driving Quality and Business Improvement



Quality and Continuous Improvement is driven through the introduction of a modern Integrated Management System, focus on compliance culture, clear and stretching quality KPIs and the Better Every Day concept which embeds Lean improvement and leadership principles.



Integrated Management System (IMS)

The introduction of a modern Integrated Management System will deliver::

- A single repository for all of Network Rail's policies, processes, instructions and technical standards and its creation will reduce duplication and inconsistency of management system content.
- Improved ease of access, navigation and content simplicity for users.
- One view of how the company fits together and operates, described as the process architecture. The process architecture will help clarify accountabilities, and highlight the most important processes of the company.

- Clear and mapped compliance to a range of internationally recognised standards, including ISO9001 (Quality), ISO14001 (Environment), ISO45001 (Safety) and ISO55001 (Asset Management), and clearer links between key legislation and company controls.
- A management system which it is easier to link our assurance to – meaning that our ways of working are more easily tested and improved.

The benefits of an Integrated Management System come through compliant, standardised ways of working that users can easily find and understand. This drives improvement in compliance to our stated and approved ways of working. It is vital to delivering well directed and sustained efficiencies, cost savings and performance improvement and will be an important enabler for delivery of a wide range of business objectives.

The Integrated Management System framework forms part of STE's accountabilities as the Technical Authority holding the policies, processes and standards for use across Network Rail and wider industry. The Integrated Management System also plays an important role in how devolution is embedded. It must stay aligned to both legislation and relevant standards whilst still providing appropriate flexibility across the routes.

Development of a Culture of Compliance

The risks of not following our policies, processes and standards can be described in terms of safety, performance, inefficiency and failure to meet legislation. However, our ability to drive improvement and effectively learn lessons across the company is also seriously affected if we do not have a culture of compliance, as we cannot embed this change. Improving our compliance is addressed by tackling the different factors that drive compliance levels:

- **Quality of requirement** – Increasing the level of stakeholder engagement in development of policies, processes and standards, and understanding of the impact and benefit of this content.
- **Understanding of requirement** – Addressed through clearer, easier to understand instructions in the IMS, and improvements to the clarity of accountabilities and the ways in which briefings and awareness reach those effected.
- **Quality of assurance** – understanding the levels of compliance, acting on this intelligence, and identifying the opportunities to improve the policy, process or standard.
- **Compliance culture** – reinforcing the importance and value of compliance, and the risks of non-compliance through training, briefing and awareness.
- **Accountability** – holding each other accountable in cases of non-compliance.

Enhancing Assurance

The effectiveness of, and compliance to, the policies, process and standards in our management system is measured by our assurance activities. These clarify risks and help to direct improvement activity. Network Rail has established models of assurance, which will be improved by linkages between processes and ISO standards and legislation as well as links between organisation and processes in the Integrated Management System. The improvements will lead to clearer and more valuable system and compliance audits at all levels of the organisation. The aim is to drive value based audits and investigations – not just focusing on each individual finding when an audit or investigation is performed but also looking at what the information combined tells us through trends and analysis providing input at a strategic level.

Quality KPIs

Network Rail has a well-established scorecard which is the basis for managing performance. This scorecard will be supported by the development of Network Rail's Key Performance Indicators for Quality. The Quality KPIs will focus on quality performance including cost of non-quality, non-conformances, re-work, corrective actions and customer complaints. These KPIs will inform and prioritise improvement work at a national and local level.

Better Every Day

Key to driving efficiency is the empowerment and engagement of the whole organisation. Lean and continuous improvement techniques have transformed manufacturing and service sector efficiency for over 50 years and the core principles and process tools have since been used successfully in transformation of all kinds of businesses - from law firms to the BBC to National Grid. Our Better Every Day concept is founded on the same principle: that an empowered workforce challenging waste, striving for customer value, and making many small changes will deliver safety, quality, performance, and efficiency improvements.



The Better Every Day concept will include:

- **Framework** – defining the Network Rail approach to structured continuous improvement.
- **Training** – enabling the business to efficiently and effectively meet its 50% 'Lean / Continuous Improvement trained' target.
- **Knowledge Share** – maximising business benefit from local improvements and learnings.
- **Maturity Assessment** – understanding the current state of the continuous improvement culture throughout the business and support teams to develop their next steps for improvement.
- **Lean Leadership** – embedding continuous improvement in everyday management processes and behaviours .
- **Benefits Management** – developing a consistent method to capture, share and validate improvement generated from Lean and continuous improvement activity.

Lean Process Optimisation

With clear processes defined and mapped in the Integrated Management System it will be possible to run structured Lean process optimisation following strict and defined methodologies. These methodologies will be based on known and tested best practice ways of working whilst also adjusted to Network Rail. Processes will be selected for optimisation through a maturity model based on importance and effectiveness. The process optimisation approach will have a series of steps including:

- **Identify** – finding the best targets for process improvement basis of cost, performance impact, safety, engagement or some other factor.
- **Map** – mapping the detail of the process, the valuable outputs and costs, and understanding how the process is delivered.
- **Optimise** – having developed a deep understanding of a process, improvement tools can be used to define how to improve, typically through people, process or technology.
- **Implement & Monitor** – delivering the change and the predicted change in performance, and ensuring that the changes stay embedded.

The Quality Strategy in Summary

The elements of the Quality approach are designed to work together, in support of achieving excellence; The Integrated Management System as the foundation for everything we do – making it easy to find and understand what is expected of everyone. Working on the Development of a Culture of Compliance and also Enhancing Assurance means that we minimise risks, understand how effective our policy, processes and systems are, and can drive improvement that is measured in our Quality KPIs. This better understanding of how we work and our performance levels is then impacted in our ambition to be Better Every Day, creating the culture and capability to support continuous improvement, and giving our people the tools for Process Optimisation which ensures our most important processes are as good as they can possibly be.



Targets

Figure 18: Key targets for CP6

Improvement area	Objective	Target	Enabled by	Comment
Health & wellbeing of our workforce	To reduce mental health related sickness absence	30 % reduction from the CP5 exit baseline	Theme C Leading Health, Safety and Sustainability on the railway	The mental health and resilience project will continue into CP6 with a further focus on training and education, and deployment of mental health and wellbeing champions to achieve a supportive culture of wellbeing, with the long term aim of reducing mental health related sickness absence which currently stands at an average of 14 % (2014-2017). Through delivery of key projects and the use of external health providers, we aim to optimise the occupational health management of our work force by effectively mitigating, monitoring and diagnosing occupational health conditions. Our aim is to be proactive in supporting improved management and health awareness by changing behaviours that influence long term ill health.
Safety of our workforce	To further reduce workforce safety risk	A further reduction in the Lost Time Injury Frequency Rate (LTIFR) to 0.17 for each Route	Theme C Leading Health, Safety and Sustainability on the railway	To keep improving workforce safety our focus will be on both technical improvement, maturing behavioural safety, implementing a new integrated management system and the delivery of projects through the Home Safe Plan and local route plans, with all projects selected based on risk. The key focus areas will be: <ul style="list-style-type: none"> • Safer trackside working • Safety leadership • Fatigue risk management • Integrated management system
Safety of trains	To further reduce train accident risk	A further 10% reduction in train accident risk from the CP5 exit baseline	Theme A Technical Leadership	This reduction will be achieved primarily through improved inspection techniques, better asset management and further improved operations and risk management. Within CP6, Network Rail have identified over 50 key initiatives to continue to reduce train accident risk. The key contributors to this reduction will be: <ul style="list-style-type: none"> • Improvement to the way we inspect, maintain and renew our drainage assets • Targeted vegetation management • Measures to reduce the risk of underbridge scour at higher risk sites • Further risk targeted investment and remediation of our structures assets • Further level crossing risk reduction initiatives • Review of our solid state interlocking signalling assets
Safety at Level Crossings	To further reduce level crossing risk	A further 5% reduction in level crossing risk from the CP5 exit baseline	Theme C Leading Health, Safety and Sustainability on the railway	Whilst there is no 3rd party funding available for CP6, routes will continue to invest in improving the safety of level crossings. In CP6 we aim to reduce level crossing risk by a further five per cent, taking into account the predicted growth in rail services, the number of road journeys continuing to rise and localised pressure from population growth. This will be achieved through targeting higher risk user-worked and footpath crossings, automatic half barrier road crossings, open crossings and some bridges and diversions to enable closure, with each decision being tested using ALARP principles. The key contributors to this reduction will be: <ul style="list-style-type: none"> • Installing overlay systems at passive crossings, replacing telephones and whistleboards where possible • Renewing automatic level crossings with safer designs • Development and rollout of automatic full barrier crossings • Red light safety cameras • Risk-based closures where opportunities arise • Targeted level crossing safety awareness campaigns
Energy & Carbon Levels	Non-traction energy reduction	A further reduction of 18% from the CP5 exit baseline	Theme C Leading Health, Safety and Sustainability on the railway	To play our part in delivering the UK's carbon emission reduction targets, we will continue to become more energy efficient and reduce our carbon emissions by supporting routes and other business units to achieve these targets, through the implementation of energy efficiency measures across our estate and operating good-practice energy management standards.
	Carbon reduction from non-traction operations	A further reduction of 25% from the CP5 exit baseline		
Asset Reliability	To improve the availability of the infrastructure, supporting the routes to achieve a reduction in the level of service affecting failures in the level of service affecting failures in CP6	Greater than 10% reduction in the level of service affecting failures by the end of CP6	Theme D Driving Intelligent Infrastructure	A critical factor underpinning train performance is the reliability of Network Rail's assets. By the end of CP5, we are forecasting to have reduced the number of service affecting asset failures by 17 per cent. This reflects the benefits of devolution with local teams having a better understanding of their assets, enabling better targeting of maintenance and renewals. Routes are forecasting to reduce the level of service affecting failures by a further ten per cent during CP6. This is lower than the levels achieved during CP5, which included an improvement of 11 per cent in the first two years of the control period. This reflected an improved focus of asset management activities on critical assets. As a result, we achieved a step change reduction in failures. The improvement in asset reliability will be achieved through continuous improvement and our Intelligent Infrastructure programme, which has been at the heart of Network Rail's strategy for many years. We are unquestionably leaders in the way we use train-borne inspection devices to monitor the condition of track such as through the use of ultrasonic testing, machine vision inspection of track and eddy current crack sensing. Our ORBIS programme has transformed how we turn vast amounts of data into insight to optimise asset management decision making.

Section 4: Risks, Opportunities, Constraints and Assumptions for the 10 Functional Areas

10 Functional Areas

The 10 functional areas own the strategies that support the routes and other customers to manage and enhance their capability to deliver their plans and services. The functional areas build new capability, set frameworks and deliver support, and provide assurance and improvement; the routes use new capability, implement policy with Group STE support, and implement assurance. Each of the 10 functional areas identifies work plans against business cases that are driven by addressing the challenges, risks and opportunities of its strategy in close collaboration with customers and stakeholders. How customers are engaged is summarised in section 3 under Technical Leadership.

This ensures risks are mitigated across all the 10 strategies owned by Group STE which in turn mitigate risks owned by the wider business enabling the delivery of benefits to the railway. A summary of the risks managed by Group STE and the risks managed by the wider business is shown at Appendix C.

Research, Development and Technology

The R,D&T functional area supports the CRTO to lead technology strategy in NR and across the rail sector, managing R,D&T funds and securing third party investment, managing UK and European R,D&T delivery programmes including Shift2Rail and managing the testing and validation facilities at the RIDC as part of the UK Rail Research and Innovation Network.

Engineering and Asset Management

The Engineering and Asset Management functional area develops our people and improves process, technology and information to better manage infrastructure assets for a safe, reliable and sustainable railway at optimal whole life cost.

Maintenance

The Maintenance functional area drives efficient and effective maintenance through alignment of standards, business systems, benchmarking, maintenance reliability initiatives and business improvement, leading the Intelligent Infrastructure Programme on behalf of Network Rail.

Operations principles

The Operations Principles functional area evolves operations principles in line with changing needs and opportunities for a safe and efficient railway by ensuring staff have the data, tools, equipment and systems to make informed decisions to manage the operational, safety and performance risks.

Health and safety

The Health and Safety functional area provides expert advice and business partner support to all areas of Network Rail and delivers prioritised Health and Safety projects with the highest health and safety impact. This area holds the safety authorization for Network Rail and develops a business-wide competency framework for everyone discharging QHSE roles.

Quality

The Quality functional area develops and maintains an Integrated Management System compliant with key standards ISO9001, ISO14001, ISO45001, and ISO 55000 enabling better performance through standards and controls, assurance, risk and improvement.

Environment & Sustainability

The Environment & Sustainability functional area enables sustainable business performance, delivering social value and maximizing opportunities for socio-economic growth, protecting and enhancing the natural environment, creating sustainable energy solutions, emissions reductions and adapting the railway for improved resilience against future weather conditions as a result of climate change.

Security

The Security functional area develops the management systems, policies, process and culture to protect people, railway infrastructure, cyber (technology and information), buildings and property, equipment and materials from hostile threats.

We have already made great progress in our cyber security arrangements, aligning to the 'National Cyber Security Centre 10 Steps', which protected us from high-profile attacks in 2017. However threats to the railway are increasing; trespass, theft, vandalism and cyber attacks are a daily challenge impacting our operations and costs.

We will continue to evolve our security measures to mitigate these risks and in doing so achieve compliance with revised security regulations. Working with our industry partners and the British Transport Police we aim to reverse the trend of security attributed losses, through the introduction of a formal security management system.

Information Management

The Information Management function equips employees with the skills and understanding to enable data assets to be recognised as such and the value from data to be fully exploited; supporting innovation, collaboration, productivity and competitiveness.

Innovation

The Innovation functional area is critical to delivering value to the Rail industry from all the Research and Development programmes and technology transfer from other industries, supporting improvement across the business and playing a particularly important role enabling the rail industry Rail Technical Strategy Capability Delivery Plan (RTS CDP) with a planning horizon of 30 years.



Research, Development & Technology

Creating prototype systems and equipment as part of new ways of working to enable a safer, more reliable, efficient and customer friendly railway.

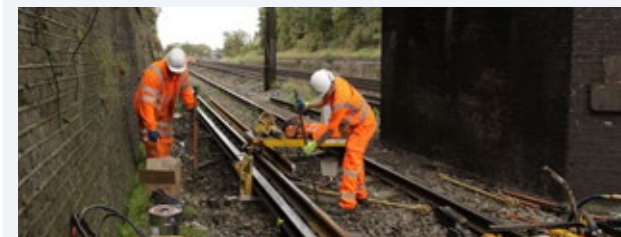
	Why	Outcome Vision	
Challenge	To create new infrastructure-related capabilities enabling optimisation of today's railway and transformation to a future railway. The key capabilities include trains running closer together, minimal disruption to train services, optimum energy use, services timed to the second and flexible freight; all underpinned by accelerated research, development and technology deployment.	Feels Like	All customers have confidence that technology solutions are being progressed with urgency to meet the most pressing business needs. They perceive a mix of incremental, step change and game-changing technology solutions and see evidence through RIDC and the wider UKRRIN.
Risk	Development and Introduction of Technology. Failing to develop and introduce the technology Network Rail requires, resulting in an inability to meet our control period strategic business plan outcomes.	Customers Say & Do	Customers see the pipeline of emerging systems and equipment and understand the potential opportunities it unlocks. Customers believe it's vital to plan to exploit emerging technology and do so, tracking its progress.
	How	Looks Like	
Owner	Senior Programme Manager (R,D&T)	Behaviour	R,D&T starts with implementation of the solution in mind. Achieved through close collaboration with technical, commercial and operational colleagues with a relentless focus on the business case.
Action 1	Manage NR's R,D&T under one industry plan, contributing to industry strategy, delivery and governance including managing NR's accountability for the R,D&T industry fund.		
Action 2	Greater investment and collaborative programmes, seeking commercial financing and partnerships with third parties.		
Action 3	Leading and delivering programmes including continuation of Shift2Rail fulfilling NR's legal commitments until 2024.		
Action 4	Integrated simulation, testing and validation facilities at Integrated simulation, testing and validation facilities at the Rail Innovation and Development Centres (RIDC)" as part of the UK Rail Research and Innovation Network (UKRRIN).		
Action 5	More and quicker route to first in class deployments, accelerating the market readiness of systems and equipment and integrating into planning in NR and industry.		



Engineering & Asset Management

Developing our people and improving process, technology and information to better manage infrastructure assets for a safe, reliable and sustainable railway at optimal whole life cost.

	Why	Outcome Vision	
Challenge	To continually improve safety whilst driving down cost through optimised asset management policy, standards, assurance and innovation.	Feels Like	A high performance culture where key processes are known, tracked and improved on a continuous basis. Planning across all required disciplines aligned, with integrated decision support tools.
Risk 1	Asset management excellence. Failing to develop, embed and demonstrate excellence in asset management, resulting in an inability to achieve efficiencies, CP6 outputs, and long term sustainability.	Customers Say & Do	Customers see information insights from upskilled staff and analytics allow greater knowledge of infrastructure systems, allowing better decision making.
Risk 2	Data quality governance and assurance. Failing to provide appropriate governance and assurance of asset data quality leading to inaccurate or unknown accuracy of asset-related data.		
Risk 3	Electrical safety. Failure to deliver and implement an effective electrical system management framework leading to a serious safety incident, non-compliance to legislation, prosecution and significant rise in programme costs.		
	How	Looks Like	Continuous improvement projects, Standards and controls can be proved to be effective. Comprehensive benchmarking measures exist.
Owner	Chief Engineer	Behaviour	Challenge and suggestions are welcomed, for example from suppliers and NR colleagues challenging standards and seeing those challenges feed through into better policy.
Action 1	Complete NR policy and standards (BCR) baseline which improves safety and performance, optimises cost and ensures compliance with legislation.		
Action 2	Introduce single competency framework and transparent multiple career path for professional engineers and asset managers.		
Action 3	Introduce a whole life cost modelling and planning system for policy development, volume and expenditure forecasting, work bank planning and delivery.		
Action 4	Introduce technology for faster, safer isolation of electrified lines.		
Action 5	Deploy systems engineering approach including robust requirements management and scope definition (PDSS) and Technical Stage Gate process part of business as usual.		



Maintenance


Driving efficient and effective maintenance through alignment of standards, business systems, benchmarking, maintenance reliability initiatives and business improvement. Delivering the Intelligent Infrastructure Programme

	Why	Outcome Vision	
Challenge	To enable Network Rail routes to deliver efficient and effective planned maintenance for all their operational assets through common tools, processes and technology as part of a fully integrated asset management strategy.	Feels Like	Customers feel engaged through strong collaboration to agree trade-offs between network availability and sustaining asset reliability to balance performance and cost.
Risk	Maintenance. Failure to provide a suitable framework and associated delivery plan to enable the routes to achieve maintenance cost, safety and performance optimisation leading to Network Rail not achieving its applicable corporate objectives.	Customers Say & Do	Routes will see benefits to performance and cost from the integration of intelligent infrastructure with their operations. Asset managers focus on optimising whole-life cost options and capture in Route Asset Management Plans.
	How	Looks Like	People are pivotal to planning, delivery and reviewing maintenance and provided with the necessary tools, skills and competence. We target 90% rostered hours being worked and overtime hours being less than 10%.
Owner	Professional Head of Maintenance	Behaviour	Actively sharing and receiving good practice and participating in structured continuous improvement.
Action 1	Deliver the Intelligent Infrastructure programme including asset condition monitoring and advanced data analytics for optimised maintenance intervention.		
Action 2	Cleanse asset registers and integrate condition data enabling a predictive maintenance strategy optimising cost, risk and performance.		
Action 3	Deliver Integrated Works Planning to enable assets to be managed as a system, increase production efficiency, optimise network availability, reduce wastage and improve safety.		
Action 4	Establish a framework to evolve maintenance culture through targeted and continuous coaching, development and team building creating improved behaviours, safety and efficiency.		
Action 5	Embed Risk Based Maintenance across all asset systems to optimise operational expenditure whilst reducing service affecting failures.		



Operations Principles

Evolving operations principles in line with changing needs and opportunities for a safe and efficient railway by ensuring staff have the data, tools, equipment and systems to make informed decisions to manage the operational, safety and performance risks.

	Why	Outcome Vision	
Challenge	Operations principles are necessary to implement Technical Authority policies for a safe and efficient railway...	Feels Like	Despite increasing pressures on our operational staff the railway feels like a safe environment.
Risk	A dependency of the engineering and asset management risks and maintenance risks. A key dependency to manage is the support of the trade unions.	Customers Say & Do	Customers' are able to respond more coherently in times of perturbation through integrating the National Operations Control. Customers see operations principles developed hand-in-hand with technology development.
	How	Looks Like	Continuous development and improvement of Operations Principles standards and controls. Providing transparent procedural and competence frameworks whilst ensuring operational compliance with legislation.
Owner	Head of Operations Principles	Behaviour	Providing Leadership for Operations Principles & Standards to Route Businesses and stakeholders. Taking Accountability for the delivery of Operational frameworks.
Action 1	Build on a robust assurance process established by the end of CP5.		
Action 2	Improve the integration of future technologies into business as usual so that it is effective and efficient as business as usual by the end of CP6.		
Action 3	Implement the Integrated Management and Quality Management Systems.		
Action 4	Pull through new technologies to address the operations challenge statement.		

Safety

Drive continued and sustainable improvement of safety in close collaboration with the routes and the key stakeholders inside and outside Network Rail focused on culture, systems and technology changes to deliver our vision of Everyone Home safe Every Day.

	Why	Outcome Vision	
Challenge	To protect our passengers, the public close to the railway and the workforce efficiently to get everyone home safe every day through high expertise, efficient action plans and value based assurance at all levels of the business.	Feels Like	We care about the safety of all railway workers and everyone using, and neighbouring, the railway.
Risk 1	Level crossings safety. Failure to enable the business to avoid fatalities and injuries at level crossings leading to a serious incident and political, reputation and performance impact.	Customers Say & Do	We are seen as Europe's safest railway.
Risk 2	Workforce safety. We fail to safeguard our workforce resulting in injury, single and/or multiple fatalities to Network Rail staff (employees and contractors).	Looks Like	We become a company where occupational injuries are a thing of the past.
	How	Behaviour	We benchmark ourselves with the best inside and outside the rail industry.
Owner	Chief Quality, Health, Safety and Environment Officer		
Action 1	Deliver high priority national projects through the Home Safe Plan based on thorough risk impact assessments.		
Action 2	Protect our track workers through modern technology delivering the Safer Trackside Worker programme.		
Action 3	Look out for our full workforce through fatigue and manual handling programmes.		
Action 4	Reduce level crossing risk using 'As Low As Reasonably Practical' approach and providing expertise and assurance.		
Action 5	Reduce train accident risk through monitoring of train accident risk reduction milestones and volumes across the business.		
Action 6	Drive leadership and culture change through training and awareness programmes		



Health

Through delivery of key projects, the use of external health providers and collaboration with other business functions, the Health and Well-being programme aims to optimise the occupational health management and safety of our workforce by effectively mitigating, monitoring and diagnosing occupational health conditions. Our intention is to be more proactive than reactive in supporting improved health awareness by changing behaviours that influence long term health and safety, thereby ensuring that 'Everyone Fit for the Future'.

	Why	Outcome Vision	
Challenge	1. To ensure all Route businesses and functions have a health and well-being strategic plan which is clearly aligned to the Group STE health and well-being strategy. 2. To ensure delivery of third party health programmes provide an optimal service for our business to support outputs of the health and well-being strategy. 3. To ensure both individual responsibilities and Network Rail commitments to achieve the required organisational benefits	Feels Like	A consistent management of occupational health and well-being across the organisation empowering staff to feel supported at work and knowledgeable in the area of health and work.
Risk 1	We fail to support and mitigate the health and well-being risks to our workforce leading to enforcement by Governing Bodies and a work force that is not fit and/or healthy to maintain and operate a 24/7 railway.	Customers Say & Do	A workforce fit for the future
	How	Looks Like	Health and well-being of our workforce is recognised as a cornerstone to our organisation and becomes part of every-day life both inside and outside of work
Owner	Chief Medical Officer	Behaviour	Taking an interest in your own health and the health of others
Action 1	Deliver high priority projects through the Home Safe Plan based on thorough risk impact assessment.		
Action 2	To optimise and appropriately link all the outsourced health services to ensure the successful delivery of health programmes, thereby supporting an improved proactive and health prevention framework.		
Action 3	To effectively identify those individuals that require health surveillance by implementation of a job risk matrix thus enhancing compliance to occupational health surveillance programmes, engagement, education, awareness of the hazards, associated risks, and early interventions of referrals to outsourced providers.		
Action 4	To ensure available data is used effectively to support the implementation and design of sustainable health and well-being programmes to improve the health of our workforce.		
Action 5	Protect our employees through delivery of the Mental Health Resilience Programme focused on availability of professional support, leadership training and awareness campaigns.		

Quality

Drive towards quality and process excellence through focus on the introduction of a modern Integrated Management system, compliance culture, clear and stretched quality KPIs and value based assurance achieving high quality performance across Network Rail.

	Why	Outcome Vision	
Challenge	To drive better performance and assurance through continuous improvement to services in an efficient and user-friendly way whilst achieving compliance with global standards for ways of working.	Feels Like	Delivering excellence through constant care
Risk	Poor quality performance in Network Rail can lead to social, political and economic consequences with the risk of loss to customer and stakeholder confidence. Quality performance goes hand in hand with safety performance and poor quality can therefore lead to safety risks.	Customers Say & Do	Network Rail delivers high Quality access and services
		Looks Like	Network Rail performs for our stakeholders and is constantly pursuing excellence in the way we work.
		Behaviour	Striving for excellence.
	How		
Owner	Head of Corporate Quality		
Action 1	Develop, implement and maintain a modern Integrated Management System compliant with ISO 9001, ISO 14001, ISO 45001 and ISO 55000 as a minimum.		
Action 2	Drive the Better Every Day concept providing Lean expertise, training, awareness and toolbox.		
Action 3	Provide Network Rail Lean/Six Sigma process optimisation methodology and support business in process selection as well as process optimisation.		
Action 4	Drive value based audits and assurance of Quality including lessons learned processes.		
Action 5	Focus on quality performance including cost of non-quality, non-conformances, re-work, corrective actions and customer complaints through prioritised improvement programmes nationally and locally.		
Action 6	Drive compliance culture through training and awareness programmes as well as clear accountabilities.		



Environment & Sustainability

Improving sustainable business performance, delivering social value and maximizing opportunities for socio-economic growth, protecting and enhancing the natural environment, creating sustainable energy solutions, reducing emissions, and adapting the railway for improved resilience against future weather conditions as a result of climate change.

	Why	Outcome Vision	
Challenge	Enabling sustainable business performance, including protecting and enhancing Network Rail's reputation, through attention to environmental, social and economic responsibilities.	Feels Like	We care about our impact on the environment and communities.
Risk 1	Weather Resilience and Climate Change. The railway does not meet expected levels of performance during adverse and extreme weather events, today and in the future.		
Risk 2	Energy Management. Failure to establish and maintain an effective energy management system leading to a failure to meet regulatory, financial and carbon targets.	Customers Say & Do	We are seen as a responsible provider of rail access, infrastructure and services.
	How		
Owner	Head of Environment and Sustainability	Looks Like	We are actively working to improve our impact on the environment, enhance resilience and creating social value for the communities we serve.
Action 1	Deliver a weather resilience and climate change adaptation action plan – Enhance asset and infrastructure resilience to current and future weather conditions and streamline preparation for, response to, and recovery from extreme weather events.		
Action 2	Make environmental management part of the Integrated Management System compliant to ISO14001 and support the business to manage resource consumption, responsible sourcing and better management of lineside habitat to reduce ecological surprises.		
Action 3	Include social performance management in the Integrated Management System to improve reputation, manage our impact on lineside neighbours, maximize opportunities for socio-economic growth and invest in local communities through our employee volunteering programme.	Behaviour	We operate to best practice within our Network Rail Frameworks.
Action 4	Deliver energy & carbon strategies to enable business units to implement efficiency programmes to reduce energy costs, capital carbon, generate income and reduce carbon footprint and implement an energy management system.		
Action 5	Drive environment and sustainability awareness through leadership training, competence development and awareness campaigns.		



Security


To develop the management systems, policies, process and culture to protect people, railway infrastructure, cyber (technology and information), buildings and property, equipment and materials from hostile threats.

	Why	Outcome Vision	
Challenge	Protecting the railway, our people and our business from many security threats including theft, vandalism, terrorist attack and violence .	Feels Like	Security is core to our culture and embedded in everything that we do.
Risk 1	Many security threats are increasing, leading to impacts on rail and business performance, safety, cost and reputation.	Customers Say & Do	Customers have confidence in our continued capability to safely operate the railway in an increasing hostile environment with increasing reliance on digital systems. Customers take responsibility for managing security.
Risk 2	There is an increasing regulatory requirement to manage all forms of security, including the risk of cyber attack. Failure to achieve compliance may result in unlimited fines.		
	How	Looks Like	A formal security management system proving clarity over roles and responsibilities throughout the organisation.
Owner	Chief Security Officer	Behaviour	Security is everyone’s responsibility - we will establish and maintain a safe and secure culture by ensuring our people know what is expected of them. Every new development or change is considered an opportunity to review and improve railway security.
Action 1	NRSP Implementation Plan to establish and maintain a railway security culture and achieve compliance with security regulations.		
Action 2	Develop and introduce a formal security management system, to improve security performance, governance and mitigation of risks.		
Action 3	Deliver a Security Threats Management Programme to identify and limit the impact of increasing and emerging threats, which would otherwise result in uncontrolled losses such as schedule 8 payments, asset repair or replacement costs and impacts on railway staff. Emergent threats may include new types of terrorist attack, changes to the capability of organised criminal gangs or significant increases in cyber security risk.		
Action 4	Develop and deliver a Vulnerability Reduction Programme to limit the impact of degrading assets and security measures, reducing their inflationary impact on security related losses. The programme will exploit information produced by the security management system, to identify areas of weakness that are creating the highest Security Attributed Losses, aiming to effect a net reduction of losses against the control period out-turn.		



Information Management

To equip employees with the skills and understanding to enable them to recognise the value of knowledge, information and data so that it is fully exploited, helping to drive innovation, productivity and competitiveness

	Why	Outcome Vision	
Challenge	To manage our knowledge, information and data more effectively by applying strong governance arrangements, including processes, roles, controls and metrics, to increase the trust and value that lays the foundations for innovation.	Feels Like	Managing, sharing and exploiting knowledge, information and data is valued as highly as managing physical assets, with information professionals seen as key facilitators in unlocking its power.
Risk	Failing to manage our knowledge, information and data leads to duplication, reduced productivity, increased costs, sub-optimal decision-making and the stifling of innovation.	Customers Say & Do	Customers from many areas recognise the benefits that arise from the robust management of knowledge, information and data. Customers maintain information and understand its value as an asset.
	How	Looks Like	Knowledge, information and data is protected and secured based on its value, to meet legal obligations or its risk to the operations of the railway.
Owner	Head of Innovation and Information Management	Behaviour	Sharing knowledge, information and data is the norm; restricting access without good reason is the exception.
Action 1	Deliver a refreshed and comprehensive suite of information governance standards with clear roles and accountabilities that ensures the knowledge, information and data we create is of highest quality, appropriately protected and shared as necessary to help meet business objectives.		
Action 2	Deliver a programme to develop the skills and understanding needed to look after and manage our knowledge, information and data, including a competence framework that equips our people with the knowledge and skills to recognise and exploit the value of knowledge, information and data.		
Action 3	Deliver a programme to use and share our information to help ourselves and others that encourages innovation and increase productivity.		

Innovation

Innovation is critical to delivering value to the Rail industry from all the Research and Development programmes and technology transfer from other industries, supporting improvement across the business and playing a particularly important role enabling the rail industry Rail Technical Strategy Capability Delivery Plan (RTS CDP) with a planning horizon of 30 years.

	Why	Outcome Vision	
Challenge	Increasing opportunities, accelerating the pace of development and increasing participation across NR and industry to discover and exploit new approaches and technologies.	Feels Like	The organisation promotes new ideas and it is easy to introduce new technologies and changes that add value.
Risk	Directly enables the 'Development and Introduction of Technology' risk - Failing to develop and introduce the technology Network Rail requires, resulting in an inability to meet our control period strategic business plan outcomes.	Customers Say & Do	Customers see the benefits of our investment in R&D and T in their everyday lives. Industry partners, Suppliers, SMEs and new entrants work collaboratively and find it easy to introduce their products and services on the railway.
	How		
Owner	Head of Innovation and Information Management	Looks Like	There is a clear and supportive innovation framework to introduce novel products and services to the railway.
Action 1	Understand and influence policy. Support the progressive introduction of innovation through existing procurement channels as well as inputting in the design of future procurement methods.	Behaviour	Everyone feels accountable for innovating and finding better solutions to problems in the industry. There is a culture that is open to new ideas and ways of working.
Action 2	Create the collaborative environment to enable effective cross-industry innovation.		
Action 3	Help industry build & measure capability, providing a framework so that railway businesses are clear on what good looks like in terms of designing innovation into an organisational structure to create value. The work will provide a clear view on how innovation is delivering the company goals and ensure we can quantify the value it brings.		
Action 4	Challenge barriers to market adoption, establishing clear and visible process to connect R,D&T to market opportunities and ensure those market opportunities are well understood at all levels of decision-making and committed to. A particular aim will be to improve uptake of non-safety products into market.		





Section 5: Expenditure & Efficiency

Figure 13: Expenditure table

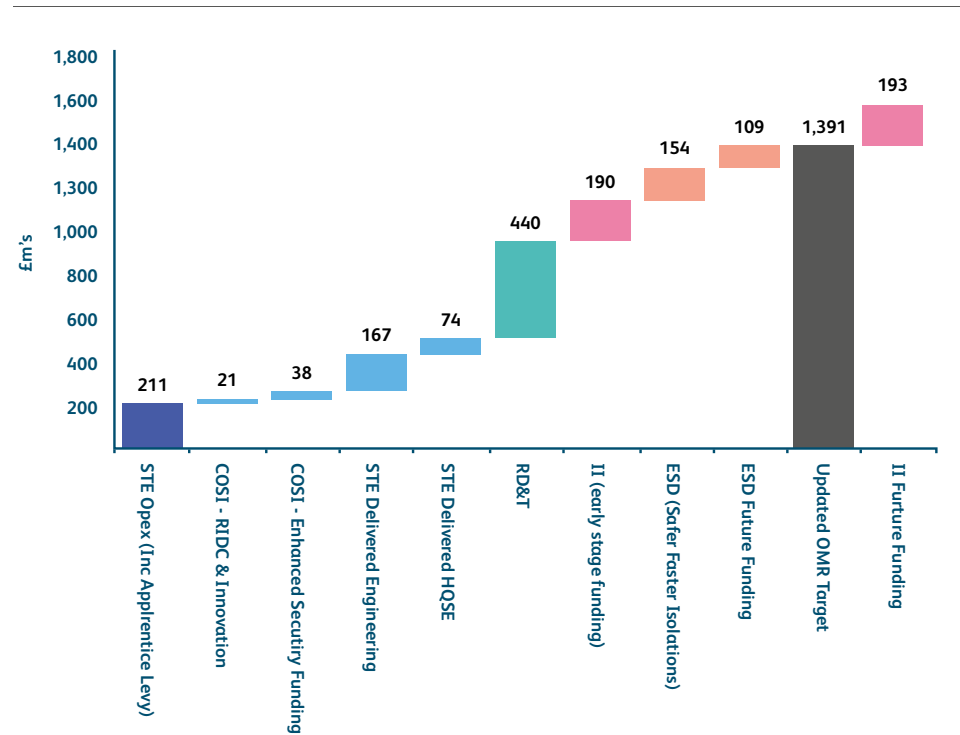
	Functional area	Level 0 & Level 1 Risks	Capital Initiatives (£m)	Operational Cost £m
Providing Technical Leadership	Engineering and Asset Management	Asset Management Excellence Maintenance	167	211
	Maintenance			
	Operations principles			
	Health and Safety	Workforce Safety Health & Well-being Weather Resilience & Climate Change	74*	
	Quality			
	Environment & Sustainability			
	Security	Cyber Security Information Governance Development & Introduction of Technology Data Quality Governance and Assurance	59	
	Information Management			
	RD&T			
	Innovation			
Driving Intelligent Infrastructure	CP6 £120m Route Benefits	190**		
Driving safer, quicker access through Electrical Safety	IRR 10% CP8, CP7 Payback	263***		
Building New Technical Capability through the Rail Technical Strategy Capability Delivery Plan	Matched funded by a further £375m from industry	440		

* Further budget provision is embedded in Route Plans for HSQE Initiatives

** A further £193m is held provisionally on the basis of the initial business case

*** £154m is initially sought with a further £109m to be held centrally and released based on improved route business cases

Figure 14: Expenditure waterfall



EC4T expenditure

Figure 15a shows the electricity consumption, year by year, for CP5 and CP6. Figure 15b shows how that consumption translates into expenditure. The cost of EC4T is almost entirely recovered through the track access charging arrangements and the recovery is also shown in Figure 15b together with the net EC4T position. Compared to CP5, the total EC4T cost for CP6 is forecast to increase by £0.84bn to £2.6bn. This is estimated using the Track Access Billing System (TABS), which in turn uses volume/consumption data from Passenger & Freight income.

The main drivers for the changes in EC4T costs are:

- East Midlands Trains: Electrification of the midland mainline (e.g. Bedford to Kettering / Corby)
- First Great Western: Expansion of the Great Western Mainline electrification westwards
- GTR: New Thameslink Timetable
- VTEC: Hybrid trains introduced
- SWT: New stock and timetable
- Northern: New services - Manchester to Blackpool
- Transpennine: Hybrid trains introduced
- Crossrail: New services on Western and Anglia

Figure 15a: Electricity consumption (GWh) for CP5 and CP6

	GWh consumption									
	CP5 year					CP6 year				
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Passenger	3,197	3,303	3,325	3,434	3,776	4,185	4,404	4,571	4,643	4,800
Freight	84	65	57	58	60	61	63	64	66	69
Non-Traction *	68	76	79	86	87	87	87	87	87	87
Total	3,349	3,444	3,460	3,579	3,923	4,333	4,554	4,723	4,796	4,956

*Non-traction costs are passed to the Routes

Figure 15b: EC4T income, expenditure and net position

	CP5						CP6					CP7	
	2014/15	2015/16	2016/17	2017/18	2018/19	Total	2019/20	2020/21	2021/22	2022/23	2023/24	Total	2024/25
EC4T income (£m)	-301	-314	-299	-336	-379	-1,630	-434	-474	-493	-505	-527	-2,434	-527
EC4T expenditure (£m)	319	332	309	348	391	1,700	455	495	514	527	548	2,540	548
Net EC4T (£m)	18	18	11	12	12	70	21	21	21	21	21	106	21

Headwinds & Efficiency

Figure 16a shows that Group STE is managing well over three times the volume of Capex works in CP6 compared to CP5. Figure 16b also shows the reduction in the Opex budget throughout CP6 for Group STE. Therefore more output is being delivered with less budget. Additional efficiencies will continue to be explored throughout CP6.

Figure 16a: Scope change, headwinds and efficiencies waterfall for capex

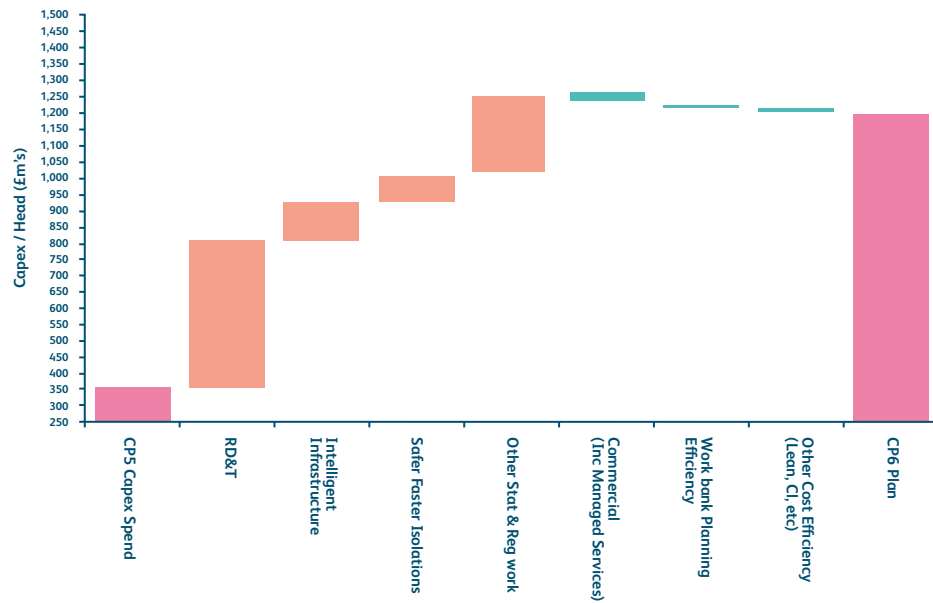
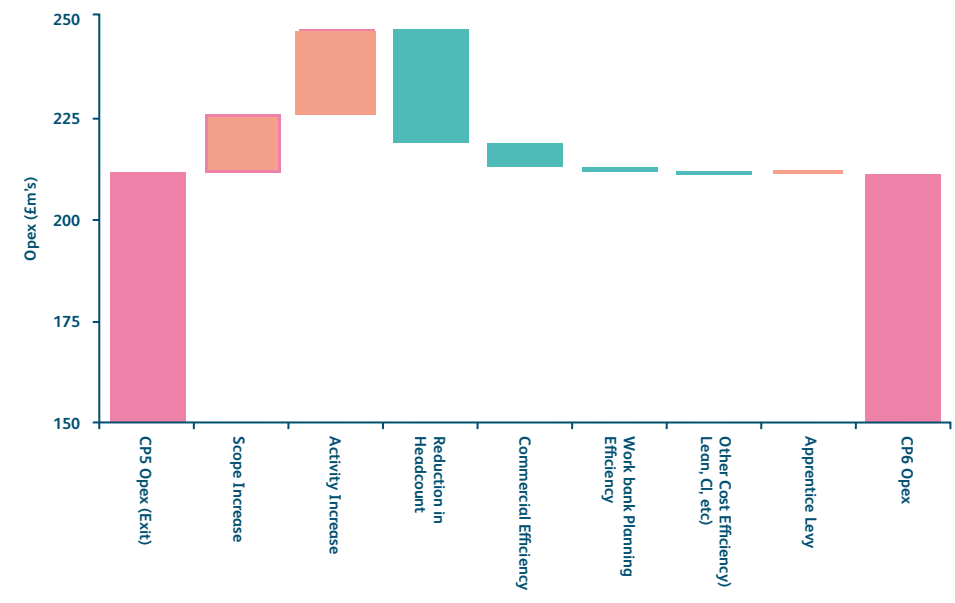


Figure 16b: Scope changes, headwinds and efficiencies waterfall for opex



Headwinds and efficiencies for capex (figure 16a)

Group STE aims to achieve capex efficiencies of by £55m across CP6:

- £35m will be achieved through new commercial arrangements comprising: A forecast £15m achieved through savings from using the managed services arrangement for work; and £20m achieved through more effective commercial planning, for example by Group STE having dedicated commercial and procurement resource.
- £20m will be achieved through a combination of improved planning and delivery of work and process improvements (Lean and Continuous Improvement).

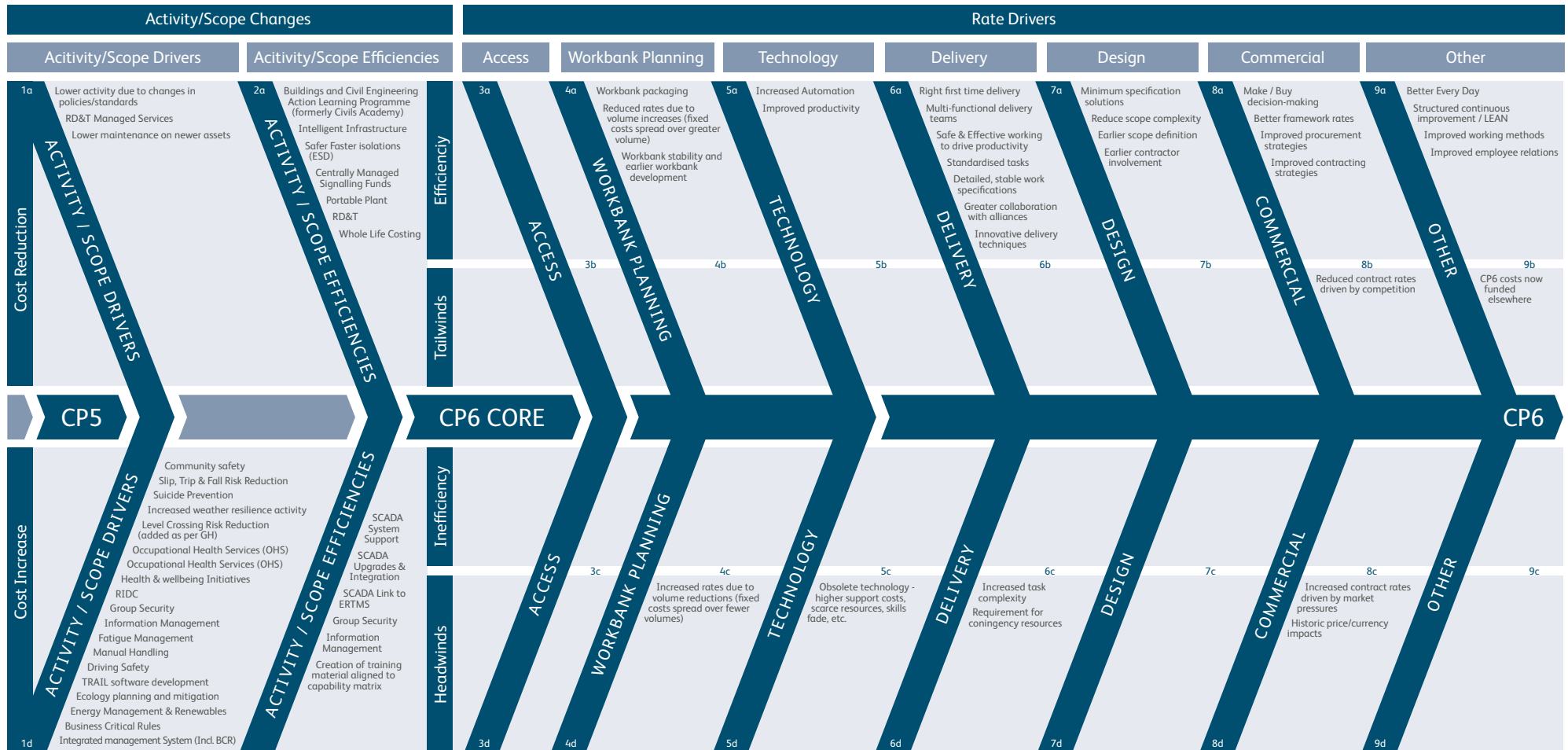
Group STE's programmes to drive intelligent infrastructure and safer quicker access through electrical safety generate headwinds for Group STE but are forecast to enable Route efficiencies across CP6 which are reflected in specific route plans.

Headwinds and efficiencies for opex (figure 16b)

Group STE aims to continue reducing headcount by 3% per annum and move to a managed services model. As well as the managed service partnership realising a forecast £6m opex saving, the partnership will address peaks in additional workload whilst operating within Group STE opex targets.

Headwinds & Efficiency

Figure 17: Headwinds and efficiency



Financial uncertainty

The information in figure 18, below, presents our estimate of the overall range of uncertainty across our expenditure and income for CP6. We have also identified the main drivers of the uncertainty ranges.

The information in this table is based on the detailed inputs provided in our opex, renewals and income submissions. Headwinds/tailwinds and efficiencies/inefficiencies are included in the spot estimates.

Figure 18: Uncertainty ranges for CP6

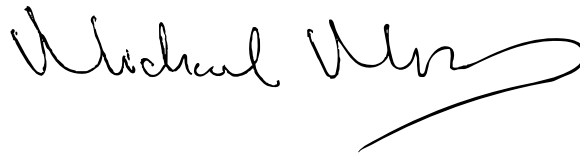
Area (S, O, M, R, Income)	Potential range (low – spot – high)	Summary of key drivers of the uncertainty range	
		Driver of range	% of range
Renewals		Intelligent Infrastructure Reductions Due to size of CP6 Scope (£354m) there is no chance of underspend as reductions due to efficiency or delay will be re planned into the scope to ensure £190m spend Increases £383m includes a further £38m of RD&T funding to deliver the full II scope	+102 % increase on SBP
		Faster Isolations Reductions Based on phased release of funds based on realised benefits Benefits not realised and funding/works reprioritisation Funding is raised within regions Delay in AC routes developing business Cases Increases First call against AC Risk Stage Gates to released funds cause delay , leading to increased cost for acceleration Delays in CP5 delivery impacting on CP6 year 1 spend	Range of Range -14 % to +15 %
		R&D Renewals Level of 3rd party contribution may increase/decrease from that anticipated which means we are required to increase/reduce the level of direct funding	Range -20 % to +5 %
		Other Reductions & Increases typically align to changes to statutory or regulatory requirement changes as well as any major incident that would impact on CP6 strategy or delivery	Range -8 % to +6 %

Sign Off

Graham Hopkins - Group Safety, Technical & Engineering Director



Mike Murphy - Financial Director



Andy Doherty - Chief Rail
Technology Officer



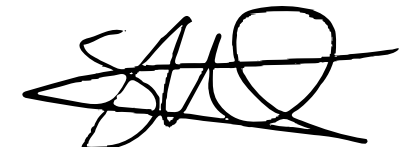
Jon Shaw - Chief Engineer



Lisbeth Norup Fromling - Chief of
Quality, Health, Safety & Environment



Simon Warner - Chief of
Operations, Security & Information



Appendix A – Funding – by year of CP6

	Functional area	Level 0 & Level 1 Risks	Capital Initiatives (£m)	Year 1 (£m)	Year 2 (£m)	Year 3 (£m)	Year 4 (£m)	Year 5 (£m)
Providing Technical Leadership	Engineering and Asset Management	Asset Management Excellence Maintenance	167	23	30	40	39	35
	Maintenance							
	Operations principles							
	Health and Safety	Workforce Safety Health & Well-being Weather Resilience & Climate Change	74	13	12	16	20	13
	Quality							
	Environment & Sustainability							
	Security	Cyber Security	59	9	12	14	13	11
	Information Management	Information Governance						
	RD&T	Development & Introduction of Technology						
	Innovation							
Driving Intelligent Infrastructure			190	65	67	48	10	
Driving safer, quicker access through Electrical Safety			263	46	63	59	49	46
Building New Technical Capability through the Rail Technical Strategy Capability Delivery Plan			440	40	60	90	120	130
Operational Cost			211	43	42	42	42	42
TOTAL FUNDING			1404	239	286	309	293	277

Appendix B – Assumptions

Key themes

B. Enabling the Digital Railway

£109M funding for the research and development of technology will be sourced from the funding for the Rail Technical Strategy Capability Delivery Plan.

C. Leading Health, Safety & Sustainability on the Railway

Initial meeting undertaken with Group STE and the Routes on 24 November 2017 generated actions against which the following next steps are proposed:

Strategy area	Assumptions and next steps
Fatigue Risk Management	Routes to embed in plan including detailed costs (headwind) for 1 December submission (recognising that there is ongoing work to do to understand detailed implications). This is consistent with the RF6 submission - £85m cost.
Safer Trackside Working	Routes agreed to commit to delivering this project in CP6 and will narrate this in their SBP document for 1 December but detailed costs / benefits / technology will be incorporated at a later date when the project is further developed. This will come either from existing route budgets or route risk fund. Develop a methodology for monitoring.
Manual Handling	Routes agreed to commit to delivering this project in CP6 and will narrate this in their RSP document for 1 December but detailed costs / benefits will be incorporated at a later date when the project is further developed. This will come either from existing route budgets or route risk fund. Develop a methodology for monitoring.
Level Crossing (LX) Risk Reduction (Renewables and pure risk reduction)	Routes to provide detail behind their level crossing renewals and risk reduction projects to BRT by 8 December at latest – this will be consistent with any high level information included in their 1 December RSP. CB to raise issue of LX Strategy to Excom and LX strategy to be re-written in light of funding constraints. Mark Carne has confirmed that the LX strategy should be on an ALARP basis. Yet to be allocated between renewals elements and other elements.
Suicide Prevention	Routes to include any suicide prevention activities in their plans but balance this off against other safety, asset management, performance risks. This should be made explicit in the plans if possible. To be allocated from 1 December 2017 submissions.
Weather Resilience and Climate Change Adaptation	Routes to include any weather resilience activities in their plans but balance this off against other safety, asset management, performance risks. This should be made explicit in the plans if possible. Routes have confirmed that this is likely to be managing current weather risks rather than any adaptation to climate change. Review where this can be split by asset and highest risk areas.
Integrated management system / Safety By Design / Safety Leadership / Slips, Trips and Falls / Risk Management / Energy Management / Community Safety / Ecology / Social Performance / Waste reduction / Occupational Health / Competence and capability	Routes confirm their commitment to the remaining projects in the Home Safe Plan and will work with Group STE to deliver these in CP6. This will mainly require people time and training with some minor Opex spend which will come from existing budgets.

Appendix B – Assumptions

Key themes

D. Driving Intelligent Infrastructure

Initial funding agreed at £191m for CP6. Benefits of £120m (IRR 9% and payback within CP7) agreed with the DRSAMs and Mike Gurtenne, Director Finance and Performance for the Route Businesses

E. Driving safer, quicker access through Electrical Safety

A workshop between the Routes and Group STE took place on 29 November 2017. As a result of this £154m of the £263m has a relevant IRR of 10% in CP8 and payback during CP7. At this stage four Routes (LNW, Wessex, South East and Scotland) are fully engaged with the other Routes developing their plans. It is recommended that the £154m is drawn down with the remaining £109m remaining as a central fund under Group STE sponsorship. Clearly, this will be made available as the remaining Routes develop their implementation strategies.

F. Building new technical capability through the Rail Technical Strategy Capability Delivery Plan

One fund for one industry plan agreed with industry through the Technical Leadership Group sponsored by the Rail Delivery Group and Rail Supply Group and funded, and with an investment case, as set out in the Initial Industry Advice in January 2017.

CP6 Phasing

Phasing of all planned capital expenditure for CP6 has been undertaken. On top of the submitted phasing a n overlay has been added using the same risk and opportunity principle we applied to CP5 expenditure during RF6. The phasing of the capex reflects the £1,404m as per Group STE settlement post RF6.

Key principles and processes moving forward

- Policies, standards and strategies will be input to, and signed-off by, Routes (RMD or DRSAMs) before being published, discussed and agreed with the ORR, DfT or external parties. This input and sign-off will include a statement and recognition of the costs of any change.
- Where possible, key QHSE conversations with ORR and DfT will have route representation.
- The Business Review Team will work with the routes to create an additional supplement to the RSP which will pull the key safety plan for the route together into one place and will act as supporting evidence for the RSP. This will be done for early January (date tbc).

Electrical Safety CP6	£m
Estimated Cost Phase 1	154
Aligned to Benefits	427
CP 7 IRR	6%
CP 8 IRR	10%
Payback	Yr 2 CP7
Future Phase of Funding	109

Appendix C – Risks

Summary of the risks managed by Group STE and the risks managed by the wider business.

The figure below is a snapshot from our Enterprise Risk Model showing, from the top down:

- The 10 functional areas in Group STE that typically own level 0 and 1 risks;
- 14 risks that are owned by the 10 functional areas;
- 48 risks beyond the risks directly owned by the functional areas that benefit from Group STE's investment in managing the 14 risks; and
- 17 Network Rail businesses across which the 48 wider risks are owned.



Appendix D – Proposed additional investment

Requirements for any additional work and funding for Group STE during the course of CP6 will be developed with the appropriate business justification and delivery mechanisms. If such works and funding arises then an application will be made from potential funding sources, such as the NR Discretionary Fund.

Currently this consists of the following items identified:

- £193m in relation to Driving Intelligent Infrastructure (II); phase 2 of the £393M total for the II programme
- £109m in relation to Driving Safer, Quicker Access through Electrical Safety (ESD); phase 2 of the £263M total for the ESD programme
- Relevant for any security works that might emerge during the course of CP6.

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