OFFICE OF RAIL AND ROAD

2018 periodic review final determination

Supplementary document - Review of Network Rail's proposed costs

October 2018

Contents

About this document

The 2018 periodic review (PR18) is the process through which we determine what Network Rail[1] should deliver in respect of its role in operating, maintaining and renewing its network in control period 6 (CP6)[2] and how the funding available should best be used to support this. This feeds through into:

- the service that passengers and freight customers receive and, together with taxpayers, ultimately pay for; and
- the charges that Network Rail's customers, including passenger, freight and charter train operators, will pay for access to its track and stations during CP6.

In June 2018, we consulted on our PR18 draft determination[3], setting out our proposed decisions in all of the main areas of PR18. Following receipt of consultation responses, we have reviewed stakeholders' comments and these have helped to inform the final decisions set out in our final determination. We are grateful to all those who responded to the consultation.

Accordingly, the final determination sets out our overall decisions on PR18. Among the documents that we have published is an overview document, setting out:

- our decisions in all the main areas of PR18;
- a summary of how we will regulate Network Rail's delivery in CP6; and
- next steps in PR18.

In addition, there are high-level summaries of our main decisions for each of England & Wales and Scotland.

We have also published a document summarising stakeholders' comments on the PR18 draft determination and our response to these.

The full set of documents that form the final determination is set out in the box overleaf[4].

[1] All references to Network Rail in this document are to Network Rail Infrastructure Limited.

[2] CP6 will run from 1 April 2019 to 31 March 2024.

[3] The full suite of PR18 draft determination documents are available from this webpage. To access earlier consultation and conclusions documents that led up to the PR18 draft determination, please see the map of these documents here.

[4] Our policy on managing change will be published in November 2018. Some documents, such as the consultancy and reporter studies, will be published shortly after the final determination.

Our final determination documents (includes weblinks)

PR18 final determination overview document

England & Wales summary

Scotland summary (and settlement details)

Settlement documents

- FNPO route
- System Operator

England & Wales

- Anglia route
- LNE & EM route
- LNW route
- South East route
- Wales route
- Wessex route
- Western route

PR18 draft determination consultation – summary of comments and our response

Supplementary documents

SBP assessment

- Scorecards and requirements
- Health & safety
- Review of NR's proposed costs
- Other single till income
- Stakeholder engagement

Policy

- Financial framework
- Review of network licence: conclusions from consultation
- Overview of charges & incentives decisions
- Infrastructure cost charges conclusions
- Variable usage charge conclusions

Other documents

- Glossary
- Managing Change Policy
- Consultancy & reporter studies
- Grading of Network Rail's route and System Operator strategic plans for CP6

Context

1. Network Rail has performed poorly over recent years in terms of delivering efficiently against its plans or ORR's determination, and in important areas it is now substantially less efficient than at the end of CP4.

2. Measuring the company's performance against our PR13 final determination, over the first three years of CP5 in Great Britain, for the work delivered, Network Rail underperformed by approximately £2.7bn on renewals and £0.3bn on maintenance (both in 2016-17 prices). In Scotland, it underperformed by around £153m on renewals and £5m on maintenance (likewise, in 2016-17 prices).

3. In 2017, we spent some time focusing on the underlying causes of this deterioration in renewals efficiency[5]. This is difficult to analyse in a purely quantitative way and the significance of the possible causes will vary by location and asset. In our view there was evidence that the following have been material factors in driving recent trends in efficiency:

   - Network Rail was poorly prepared to deliver renewals at the start of CP5;
   - its PR13 efficiency improvement plans were not well founded;
   - the company reacted slowly to the problems on efficiency; and
   - there was increased pressure on access to the railway to carry out work.

4. In addition, the reclassification of Network Rail into the public sector in 2014, with the introduction of fixed borrowing limits, meant that when problems arose this prompted repeated re-planning of work to stay within the new funding constraints. We also highlighted that the restructuring of Network Rail into devolved route businesses/functions had initially led to unaffordable increases in the scope of work in some areas, as route teams delivered additional work for their customers. This had the effect of compounding affordability constraints elsewhere.

5. It is important that Network Rail learns the lessons from CP5. Reflecting this, we highlighted in our strategic business planning guidance to Network Rail that in preparing its plans for CP6 the company should set out its assessment of what have been the drivers of greater and reduced efficiency during CP5 (particularly in respect of known areas of weaker than expected performance). We also asked it to explain how the plans for CP6 build on successes and address identified weaknesses.

6. When reviewing whether Network Rail's plans have identified an appropriate level of efficiency improvement, it is useful to distinguish between two baselines against

[5] These figures are based on the Financial Performance Measure (FPM) which reports how well Network Rail is performing once we take account of whether the company has delivered the work that it planned to undertake. This ensures that a deferral of important renewal work is not recorded as an 'efficiency'.

which efficiency can be measured. First, there is the level of cost that a fully efficient company would incur, given current technology, when delivering the outcomes required for control period 6 (CP6). This is often referred to as 'frontier efficiency' and is a largely theoretical concept. Second, there is the level of cost that we consider Network Rail – given its current performance and current technology capability – can reasonably be expected to deliver. In the context of a public sector organisation, where it is particularly important to set challenging but ultimately realistic efficiency targets (not least to provide effective reputational incentives), it is the second of these that we are focusing on.

7. In short, we are asking what level of efficiency challenge it is reasonable to set Network Rail's management, given where the company is in terms of its ongoing transformation.

8. When considering this, it is important to understand the different aspects of Network Rail's efficiency, and where we have evidence on what Network Rail should be able to deliver. In particular, we can distinguish between:

   - **A: Longer-term trends on efficiency up to 2017**: our ongoing monitoring and 2017 review of renewals efficiency highlights the longer-term decline in Network Rail's efficiency levels within CP5, driven by a number of changes that took place early in CP5 and which should now have been addressed.
   - **B: Evidence on current unit costs**: in many places, the company has used data from 2015-16 to inform the costing of its business plan. We have reviewed the process by which Network Rail has determined the appropriate adjustments to these numbers to identify a baseline level of costs, which are then used to understand the likely cost of delivering its plans in CP6;
   - **C: Evidence on cost pressures and opportunities**: we have reviewed how, within the company's current operations, the unit costs are likely to change over time, in response to future cost pressures and opportunities for cost savings; and
   - **D: The cost savings that could be realised as the company continues its transformation**: the business plans and available cost information are generally based on how the company has performed in recent years, albeit adjusted for some forward-looking factors under 'C'. However, the significant and ongoing programme of changes made by the company has potential to unlock significant further efficiency savings.

9. This document focuses on 'B' and 'C'. It looks at the evidence available about the level of costs included in Network Rail's Strategic Business Plans (SBPs[6]) and how

[6]SBPs were submitted for England & Wales and for Scotland.

these might change over time, without making adjustments for the potential for further cost reductions as the transformation programme realises benefits.

10. While this includes a degree of challenge on the estimating assumptions used to inform the baseline for these costs, we think that this is likely to underplay the potential for additional efficiency savings in practice.

11. In particular, Network Rail's reclassification into a public sector body resulted in a significant shift in its financial flexibility and its governance arrangements. The company could not deliver its plans within the funding that was available, which prompted an extended period of re-planning of work. During this period, the company's efficiency fell substantially, and there is evidence of relatively weak cost control.

12. This reduction in efficiency prompted a number of reviews, and provided the catalyst for a series of changes to the company. This transformation supported the reinstatement of 'business as usual' processes, which are fit for its current public sector status. It also included a substantial internal reorganisation, an increase in the role of route businesses and the creation of a distinct System Operator (SO). This leads to a series of efficiencies savings under 'A', which Network Rail should already be realising by the start of CP6.

13. Furthermore, the timing of this review means that the evidence on cost levels is taken from a period of particularly poor efficiency by Network Rail's own historical standards. We do not consider that the gains to efficiency from a more stable ownership and funding structure, or the ongoing transformation of the company, are fully reflected in the evidence on cost pressures and opportunities. More generally, the limited availability of data constrains the extent to which these inefficiencies can be accurately reversed-out.

14. Looking ahead, the existing level of transformation should lead to central services changing their approach, so that they are effective suppliers to the route and SO businesses. Over time, there will be more and better quality data to compare across the route businesses, to supplement the comparisons that can be made between the business plans and delivery, and provide a stimulus to the sharing of best practice. This means that the efficiency savings that the existing transformation will deliver over time were not fully reflected in Network Rail's calculation of unit costs used in the SBPs, not least because the benefits of this existing level of transformation will grow over time.

15. Indeed, as we set out below, Network Rail's SBPs focused on identifying 'headwinds', where there are additional cost pressures expected in future. There were very limited 'tailwinds' identified. This is all consistent with our view that the full savings relating 'A' were not reflected in 'C'.

16. In addition, Network Rail's transformation is ongoing and has yet to deliver in terms of the full benefits on efficiency. The gains from the latest and planned transformation are also not reflected in the forecast unit rates. This is not surprising – the company moved to a new internal governance structure on 1 April 2018. Similarly, there are ongoing reviews of the relationship between routes and infrastructure projects (IP), while routes have set out their plans, but are not yet delivering them. The benefits of these changes could not be reflected fully in the SBPs issued by Network Rail in February 2018, and are difficult to quantify with any degree of accuracy. These expected additional efficiency savings were also not reflected 'B', above.

17. This introduced a systematic bias in the cost forecasts, by recognising 'headwinds' without recognising 'tailwinds'[7]. This is particularly important as there are strong reasons to suspect that there will be such 'tailwinds', and opportunities to realise cost savings going forward. These include, inter alia:

    - the move to 'business as usual' planning and delivery of work (in contrast to the CP5 experience that was dominated by uncertainty and substantial re-planning of work);
    - the establishment of a stable funding settlement, which provides committed government funding that the company can use to meet a range of risks (in contrast to the fundamental shift that took place at the start of CP5);
    - the move to bottom-up planning, which provides a more detailed and stable basis against which to plan (in contrast to the top-down and high level plans that were in place for CP5);
    - the opportunity presented by comparison between routes, which provides more information and better reputational motivation on management teams (in contrast to the centralised decision-making that typified the early years of CP5);
    - a regulatory framework of scrutiny, monitoring and enforcement that is designed for a public sector organisation (whereas the CP5 framework was designed against an expectation of Network Rail remaining in the private sector); and
    - the likely further efficiency savings that will be realised by the changes that the company put in place before submitting the SBPs, those that will flow from the changes that have recently been made, and that are likely to flow from the ongoing process of transformation.

18. These factors led us to set a significant 'efficiency challenge' to Network Rail in our draft determination. The company, whilst not accepting all of our logic, has responded positively to our challenge this response has informed our findings about the efficient cost of Network Rail's activities in our final determination.

[7] See chapter 7 for explanation of headwinds and tailwinds.

1. Introduction

1.1. One of the principal purposes of PR18, set out in our initial consultation document[8], was to establish a more efficient and better-used railway, delivering value for passengers, freight customers and taxpayers in CP6 and beyond. Scrutinising Network Rail's cost proposals and delivery planning is key to this overall objective as it:

- determines the funding required during CP6 to deliver the level of network performance set out in Network Rail's scorecards, and the maintenance and renewals work necessary to sustain assets in the short, medium and long term;
- considers the direction and pace of Network Rail's ongoing initiatives to improve effectiveness and efficiency so that the route settlements are based on an informed view of likely progression rather than a snapshot in time; and
- holds Network Rail to account for delivering improvements in its business planning process to help ensure plans are of high quality.

1.2. As enhancements are now treated separately, the scope of this work was to examine:

- maintenance and renewals costs for infrastructure assets, such as track, structures and earthworks (about 79% of Network Rail's proposed operations, support, maintenance and renewals (OSMR) costs);
- operations costs, such as signalling and mobile operations management (about 11% of proposed OSMR costs); and
- support costs, which include a wide range of costs such as central human resources and information management (about 10% of proposed OSMR costs).

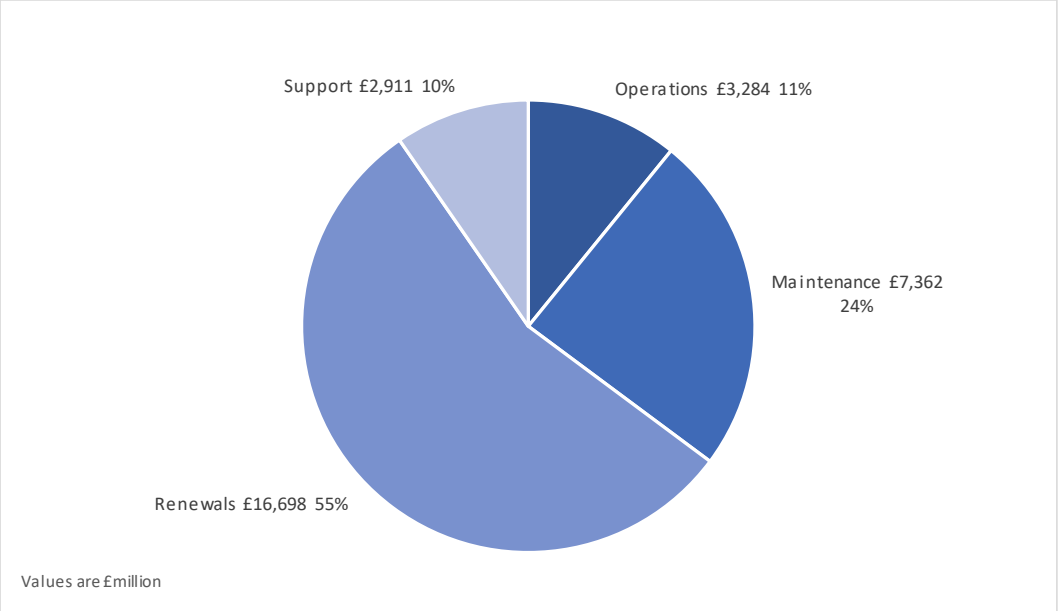
1.3. These costs are shown in Figure 1.1 below. These (and other costs referred to in this document) are stated at 2017-18 prices and are the levels proposed once efficiency and headwind adjustments have been made ('post-efficient'), unless otherwise stated. Costs stated have been sourced from Network Rail's SBPs.

1.4. The maintenance, operations and support costs referred to above are described as 'controllable opex' in the SBPs. The SBPs also included 'uncontrollable opex' which covers industry costs such as traction power and business rates. Apart from specific items discussed in chapter five of this document, this category of expenditure is not considered in the costs referred to in this document.

[8] *2018 periodic review of Network Rail (PR18) – initial consultation*, ORR, May 2016. This may be accessed here.

1.5. The SBPs also included circa £1bn of digital railway-related enhancements and we have excluded these from our reported costs, which is explained in chapter six on digital railway.

Figure 1.1 - Overview of Network Rail's costs



Source: Network Rail consolidated databooks, 2017-18 prices (post-efficient) excluding Digital Railway programme

1.6. The approach to scrutinising each of these categories differs considerably as they are each distinct. We reviewed all cost categories but focussed more on the factors which determine maintenance and renewals expenditure.

1.7. Reflecting Network Rail's size and its devolved structure, we adopted a risk-based approach. Using factors such as data quality and current asset condition, we narrowed down the focus of our most detailed scrutiny to areas where errors could have a major impact. Our approach also relied on whether we agreed with Network Rail's own assurance reviews.

1.8. While Network Rail's submission was finalised in February 2018, we have worked to gain progressive assurance of its plans over the 12 months leading up to this. We visited every route to explain what evidence we expected to see in its submission, identifying gaps in time for them to be addressed through Network Rail's continuous planning.

1.9. Alongside this work, we also engaged specifically with Network Rail over the summer of 2017 in finalising the Statement of Funds Available (SoFA). This involved jointly commissioning the independent reporter (Nichols) [9] to provide assurance on Network Rail's progress in developing efficient plans for CP6 between publication of the High Level Output Statements (HLOS) for England & Wales and

[9] *PR18 SBP Planning Assurance Mandate – Main Report (Reference L2Ni007)*, Nichols Group Ltd, 26 September 2017. This may be accessed here.

Scotland on 20 July 2017 and the planned issue of SoFAs for England & Wales and Scotland in October 2017.

1.10. We published our interim findings in the draft determination in June 2018. Interested parties were invited to submit responses to this on or before 31 August 2018 and we received responses from the Department for Transport (DfT), Transport Scotland, Network Rail, transport authorities, trade bodies and trade unions.

1.11. Our responses to the comments we received can be found in in our summary of comments document[10]. This has led to us making significant changes to the version of this document which was issued as part of the draft determination in connection with asset sustainability (chapter two), research and development (chapter three) and route efficiency plans (chapter seven).

1.12. The draft determination indicated that we planned to undertake some further work in connection with support costs and the results of this have been added to chapter five.).

1.13. We have also taken the opportunity to make other revisions and updates to this document to reflect other feedback. To assist readers in identifying significant changes we have identified these at the end of each chapter.

1.14. Based on the above, we have completed our detailed scrutiny of Network Rail's submitted SBPs. Our conclusions and the underpinning evidence are set out in this document under the following headings:

- Maintenance and renewal costs: examining Network Rail's justification for the costs to each route of maintaining and renewing the infrastructure, specifically:
  - Asset management planning: the processes by which Network Rail has identified how much and what work is needed on its assets ('workbanks');
  - Cost planning: how Network Rail has forecast the cost of delivering these workbanks; and
  - Delivery planning: how Network Rail has approached ensuring capital expenditure will be delivered in practice within the capability and capacity of internal and external supply chains.
- Research & development (R&D) costs: Network Rail's plans for R&D and the associated governance arrangements.
- Operations costs: examining Network Rail's justification for its day-to-day operation of the network;

[10] *Consultation on the draft determination –Summary of comments and our response*, ORR, October 2018. This may be accessed here.

- Support and other costs: examining Network Rail's justification for the forecast level of costs in its support functions (including associated renewals costs borne by central functions);
- Digital railway costs: some of the overall Digital Railway programme costs were included in the SBPs. This raises specific issues and we have therefore reported on these in this document;
- Route efficiency plans**:** examination of each route's efficiency plans, including treatment of factors affecting specific initiatives such as headwinds.

1.15. We undertook some econometric benchmarking of route maintenance delivery unit (MDU) costs, which is published in a separate document[11]. This work supported our examination of maintenance costs and focussed on benchmarking between Network Rail's routes rather than with international comparators with similar functions and structures.

1.16. The application of this analysis was limited by constraints on data quantity and quality but it identified unexplained variances in performance between routes and their MDUs. This indicated potential inefficiencies in maintenance planning and delivery processes. This supports our findings in other areas, notably the review of efficiencies. Our analysis established a basis for improvements to data quality and a way forward for benchmarking initiatives to inform our ongoing regulatory activities.

1.17. The scope of work described in this document did not cover Network Rail's income, provision for financial risk and other costs falling outside operations, maintenance, renewal and support cost categories. These were scrutinised separately and our conclusions are reported in our supplementary documents on the financial framework[12] and other single till income[13]. Similarly, the work did not cover separately funded network enhancements element of Network Rail's SBPs. Enhancements are subject to separate review and approval processes with DfT and Transport Scotland which are outside the scope of this review.

1.18. To provide context, Table 1.1 summarises OSMR costs in the SBPs submitted in February 2018.

[11] *PR18 econometric top-down benchmarking of Network Rail*, ORR, June 2018. This may be accessed here.
[12] *Supplementary document – Financial framework*, ORR, October 2018. This may be accessed here.
[13] *Supplementary document – Other single till income*, ORR, October 2018. This may be accessed here.

Table 1.1 - Summary of Network Rail costs

	Totals			
Route	**Pre-efficient £m**	**Headwinds £m**	**Efficiencies £m**	**Post-efficient £m**
Anglia	2,327	49	(212)	2,164
London North Eastern & East Midlands (LNE&EM)	4,918	152	(323)	4,747
London North Western (LNW)	5,585	129	(429)	5,285
South East	3,730	109	(309)	3,529
Wales	1,395	39	(92)	1,342
Wessex	1,984	90	(188)	1,886
Western	2,538	57	(192)	2,402
Scotland	2,805	85	(218)	2,672
Central Functions	6,552	77	(401)	6,227
Totals	**31,832**	**788**	**(2,366)**	**30,254**

Source: Network Rail consolidated Opex and Renewals databooks (2017-18 prices) excluding Digital Railway programme

Overall approach

Source material

1.19. We scrutinised the suite of material supplied by Network Rail in its SBPs, submitted in February 2018. The principal documents we analysed were the RSPs together with the supporting spreadsheets which collected together national summaries of support, opex and renewals costs (capex).

1.20. We also undertook a series of challenge meetings and deep dive reviews with Network Rail, with specific follow-up questions.

1.21. To assist our understanding of specialist areas such as cost planning of renewals, headwinds and efficiencies and risk, we commissioned three specific studies from independent consultants. We have also considered a follow-up study on headwinds and efficiencies commissioned by Network Rail.

1.22. In reaching our final determination, we also took into account additional material submitted by Network Rail in its response to our draft determination.

1.23. References to source data are identified in footnotes.

Progressive assurance

1.24. As part of our preparation for PR18 in 2017 and early 2018, we reviewed Network Rail's emerging plans and earlier drafts of the SBPs. This work included meetings with route and headquarters teams and reviews of relevant consultants' reports commissioned by Network Rail.

1.25. In addition, we commissioned several independent consultancy studies to consider detailed aspects of the emerging business planning process. This work assured us that the underlying approach taken by Network Rail was reasonable and provided ancillary information that has informed our examination of the SBPs.

1.26. ORR's ongoing monitoring of Network Rail has provided further background context to our review.

1.27. Where relevant, we have provided reference to these progressive assurance activities.

Methodology

1.28. Our review examined each cost category that was within scope (i.e. maintenance and renewals, operations and support), each of which had specific and distinct areas that we investigated. Determining efficient costs does not follow a prescribed or common formula. We therefore approached each category with a set of assessment criteria, which framed our analysis that then led to our conclusions. These tests were designed to examine the overarching questions we had for each cost category, which were:

- what is the efficient cost of Network Rail delivering its required outputs in CP6? and
- are there areas where specific measures are needed to improve confidence in delivery during CP6?

1.29. In light of a compressed timetable for producing our draft determination following the later than envisaged publication of the SoFAs and of Network Rail's SBP, it was neither practical nor proportionate to review every aspect of the SBPs in detail. We therefore developed a risk-based decision support tool, which we used to identify the priority areas for our investigation. The use of this tool and the areas selected are discussed in the relevant sections of this document.

1.30. In general terms, the process which we followed for each topic involved one or more of the following activities:

- review of relevant evidence produced through our ongoing monitoring role (both in terms of compliance with health and safety legislation and compliance with Network Rail's licence);
- desktop review of the SBPs and other source material;
- submission of follow-up questions to Network Rail and review of responses;
- challenge meetings with Network Rail's component businesses (e.g. the routes; SO; safety, technical and engineering);

- deep dive meetings to explore detailed topics identified using the decision support tool;
- review of consultant and independent reporter[14] reports; and
- review of any relevant consultation responses and specific views of funders.

1.31. In addition to our review of the source material listed above, we undertook a top-down econometric benchmarking study to seek insights into how Network Rail's routes and their maintenance delivery units compare with each other.

Issues and limitations

1.32. Our original programme for the review was based on Network Rail submitting its initial SBPs in December 2017. Although a draft was submitted on the due date, Network Rail continued to work on the plans until February 2018 – reflecting the later than expected finalisation of the SoFAs. While we were able to commence some work on the basis of the December draft, the majority of our detailed scrutiny commenced later, once we had received the finalised plans.

1.33. We are satisfied that our conclusions are based on a thorough review of the information available and represent balanced conclusions in our overall assessment.

1.34. Network Rail's business planning process is iterative, with regular updates undertaken on a progressive basis. This means that the SBPs are a snapshot of plans available at the time of their issue. Given that PR18 covers a period of five years it is inevitable that certain aspects will require further development. Similarly, it is likely that events may occur which require re-prioritisation of activity. We have sought to recognise this uncertainty in our review.

[14] Independent reporters provide us with professional advice on the quality of Network Rail's service provision, as specified in their licence, under a joint Network Rail and ORR mandate.

2. Maintenance and renewals costs

Overall context

2.1. These costs are associated with maintaining and renewing infrastructure assets, such as track, structures and earthworks (about 80% of Network Rail's proposals).

Summary of maintenance costs

Table 2.1 - Summary of maintenance costs

Route	CP5	CP6	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
	£m	£m	£m	£m	£m	£m	£m	£m
Anglia	605	646	129	133	133	127	127	126
LNE&EM	1,234	1,467	264	293	294	297	293	290
LNW	1,425	1,862	295	377	374	373	370	367
South East	754	1,015	165	206	204	203	201	201
Wales	280	332	59	68	68	67	66	63
Wessex	471	543	102	113	111	109	105	105
Western	619	715	140	144	149	141	140	140
Scotland	544	675	111	137	135	134	135	134
Central	291	108	5	18	44	14	14	18
GB total	**6,225**	**7,362**	**1,270**	**1,491**	**1,512**	**1,465**	**1,451**	**1,442**

Source: Network Rail Consolidated Opex databook, 2017-18 prices, post-efficient

Summary of renewals costs

Table 2.2 - Summary of renewals costs (exc. Digital Railway) programme

Route	CP5	CP6	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
	£m	£m	£m	£m	£m	£m	£m	£m
Anglia	903	1,220	172	198	267	275	305	175
LNE&EM	2,432	2,669	353	561	567	581	498	463
LNW	2,369	2,526	325	420	481	593	557	474
South East	1,508	1,796	253	348	436	392	331	289
Wales	724	798	93	142	172	201	170	113
Wessex	827	1,086	74	185	235	291	243	132
Western	1,236	1,355	239	278	289	302	265	221
Scotland	1,452	1,714	291	313	431	405	323	242
Central*	2,428	3,533	604	705	818	791	649	570
GB total	**13,878**	**16,698**	**2,403**	**3,150**	**3,696**	**3,830**	**3,342**	**2,680**

* Certain central renewals are discussed in association with central support functions – see section 5 of this document.
Source: Network Rail Consolidated Renewals databook, 2017-18 prices, post-efficient and excluding Digital Railway programme

Asset management planning

Assessment criteria

2.2. The following questions framed the assessment of this area:

- have route asset management plans (RAMPs) reflected local asset knowledge, safety requirements, asset policies, local output targets and other relevant matters identified in the RSPs?[15]
- have the routes committed to improving asset management capabilities?
- have appropriate workbank volumes been developed for each asset category?
- has the allocation of resources between routes by Network Rail centre been transparent and reasonable?
- have plans been developed to sufficiently sustain asset life and asset performance?

Methodology

2.3. We adopted a risk-based approach for assessing Network Rail's SBPs to identify areas where we were less confident that Network Rail's submission was robust, and areas where the real-world impact would be material. We identified which routes and/or asset categories we would investigate more deeply by undertaking a 'deep dive' review (see Table 2.3). This was based on known asset condition, known data quality and evidence collected through our regular monitoring. A number of other factors were considered:

- our professional judgement based on knowledge collected from ongoing monitoring activities;
- reviews of Network Rail's PR18 consolidated opex and renewals databooks;
- initial reviews and presentations by routes of their plans;
- the routes' position in regard to devolved transport planning; and
- the views of key stakeholders.

2.4. The outcome of this identified areas that covered 86% of renewals activity and 54% of maintenance activity.

[15]Health and safety matters are considered in detail in a separate document. See: *Supplementary document Health & Safety*, ORR, October 2018. This may be accessed here.

Table 2.3 - Schedule of deep dive reviews

	Lineside	Track	Structures	Earthworks	Operational Property	Drainage	E&P	Signalling	Level Crossings	Telecommunications	Digital Railway	STE	Route Services
LNE&EM		✓	✓	✓		✓	✓	✓	✓	N/A at route level			
Anglia			✓			✓			✓				
LNW	✓	✓		✓	✓			✓					
Western	✓		✓	✓			✓						
Scotland	✓	✓	✓		**								
Wessex				✓	✓			✓					
South East		✓	✓	✓			✓	✓					
Wales	✓	✓			✓		*		✓				
Central										✓	✓	✓	✓

*Telephone call re Sudbrook pumping station Wales

** Detailed question set used, but no physical visit.

2.5. For areas where we did not do a deep dive, we undertook a desktop review with follow-up questions directed to Network Rail where required.

2.6. In addition to the SBPs, RSPs and databooks, we examined:

- route assurance reports;
- asset policies and short-form strategies;
- Network Rail's Safety, Technical & Engineering directorate's (STE) asset management and asset activity, summary assurance overview;
- STE's assurance summary report[16];
- deliverability assurance reports;
- renewals cost assurance report;
- whole life cost narratives; and
- an assessment of Network Rail's asset management excellence undertaken by Asset Management Consulting Limited (AMCL). AMCL being appointed by Network Rail as an independent reporter on asset management.

[16] Asset Management & Asset Activity, Summary Assurance Overview, Network Rail, version 1.0.

2.7. We also held a series of meeting with Network Rail to test its overall assurance process, which covered:

- Network Rail's tier 1 decision support tool models[17] (DSTs); and
- Network Rail's internal assurance process.

Findings

Route asset management plans

2.8. During CP5 Network Rail has made significant improvements in the development of its RAMPs. We found clear evidence that plans have been developed at a local level by each route. Network Rail has also introduced a continuous planning process through which route plans are regularly reviewed based on projections for a rolling eight year period.

Data quality

2.9. Information about infrastructure assets should be treated as an asset in its own right. It should be assured, maintained and renewed with equivalent arrangements to the physical assets. This follows best practice reflected in requirements of the international standard for data quality (ISO 8000).

2.10. In 2013, we set Network Rail a target of achieving A2 level for data quality for the core asset data used in decision making. This meant the asset data should be maintained by an overarching information management system (alpha component measured on an A to D scale, with A being highest), and that the data itself should be appropriately accurate and reliable (numeric component measured on a 1 to 6 scale, with 1 being highest). While Network Rail has met the alpha component, it did not achieve the numerical component for all categories.

2.11. We found that, over the course of CP5, Network Rail has made progress in improving the quality of its asset data. This has been driven in part by the implementation of an Asset Data Governance (ADG) framework which has allowed it to deliver basic data quality requirements and dedicate resources specifically to the delivery of data quality. The delivery of the ADG project was the main factor in meeting the requirements for A-grade governance.

2.12. For the data accuracy (numeric) grading, the independent assurance of Network Rail's progress has slipped and has yet to be completed. We have therefore used Network Rail's internal indicator reports to provide an assessment of the level of progress made against this element of the target.

[17] Network Rail's set of strategic whole life cost models forecast medium and long-term activity and expenditure on its infrastructure and estimate the associated asset condition and performance. They are used by Network Rail to support the development and optimisation of asset policies, help the routes formulate their business plans, provide assurance on those plans, and create long-term forecasts.

2.13. Over the course of CP5 Network Rail has undertaken data cleansing activities, and for assets where the data quality at the start of CP5 was at or close to the level required (track, signalling and buildings) this quality has been maintained. For structures and earthworks we have found that there are indications that the quality has improved to the required level; this finding was supported by responses from routes during our deep dive meetings. However, we found that for electrification & plant (E&P) and telecommunications, there are a number of attributes which are not at the required level.

2.14. We also examined each RSP to assess proposals for maintaining asset data quality over CP6. We found that four routes (LNW, South East, Wales and Western) had provided clear documentation for their strategy regarding data governance, but similar information was missing or not sufficiently comprehensive for the other routes (Anglia, LNE&EM, Scotland and Wessex).

2.15. Where insufficient detail was provided in the RSPs, we required Network Rail to provide further information through either the route challenge meetings or written responses. We were generally satisfied with the responses provided.

2.16. Network Rail's Offering Rail Better Information Services (ORBIS) programme was launched in 2012 with the objective of enabling the right maintenance, in the right place, at the right time. This programme had delivery challenges and only eight out of ten milestones that were set for CP5 were completed on time. Two milestones, the Integrated Network Model (INM) and the Civils Strategic Asset Management System (CSAMS), were delayed. INM was successfully delivered in September 2017, whilst CSAMS remains outstanding and will not be met in CP5.

2.17. In CP5, Network Rail implemented an activity based planning (ABP) programme, which introduced a bottom-up maintenance resource planning process and cost estimating tool for those assets maintained by the MDUs. Broadly, the approach is based on the activity required to maintain each asset; the labour, plant and materials required to deliver that maintenance and the associated costs. For each MDU, its own records of time taken to complete standard jobs, non-productive time, number of plant shifts required and labour rates have been used to develop costings. We found that the ABP tool was used by all routes to build up their CP6 maintenance plans. Within the tool, the large number of standard maintenance jobs has been rationalised and standardised across all delivery units, and restructured to differentiate between planned preventative maintenance and fault finding and rectification.

2.18. This approach will enable Network Rail to obtain a clearer view of how costs are linked to specific maintenance activities. The approach also generates a bottom-up requirement for the on-track machines used for maintenance, which will allow the

supply of these resources to be managed more effectively to balance demand across the network as a whole.

2.19. In terms of collecting data from activities delivered by the wider supply chain, we found that good progress had been made putting in place the necessary contractual arrangements and in increasing contract management resources within Network Rail to make sure this happens in advance of CP6.

Capability

2.20. Since 2006, Network Rail has measured its asset management maturity by using the Asset Management Excellence Model (AMEM) by AMCL. In 2013, we set targets for Network Rail to improve its capability by the end of CP6, to achieve a score of 72% ± 2% at 80% confidence against the six subject groups used within the AMEM framework. A reassessment was undertaken between September 2017 and February 2018[18] which found that Network Rail had only achieved the 72% target in three of the six groups of asset management within the specified confidence limits although it had made improvements in the other areas. As a result of Network Rail's failure to achieve the required score of 72% in all six subject groups, we made a financial adjustment in year four of CP5.

Table 2.4 - AMCL assessment of asset management targets

Subject Group	End of CP4	Regulatory Target for January 2018	Network Rail assessed at 2018 SBPs	Achieved confidence interval at 80% level of confidence
1 AM Strategy & Planning	65.4%	72.0%	74.5%	±1.22%
2 AM Decision Making	62.8%	72.0%	69.7%	±1.70%
3 Lifecycle delivery	67.5%	72.0%	70.8%	±0.71%
4 Asset Information	70.4%	72.0%	74.0%	±0.72%
5 Organisation & People	66.1%	72.0%	69.5%	±0.93%
6 Risk & Review	63.9%	72.0%	72.7%	±1.43%
Overall	**66.0%**	**72.0%**	**71.8%**	**±0.49%**
Source: AMCL				

2.21. From these results, we have found that Network Rail has achieved a level of capability maturity which (using AMCL definitions) is classified as 'effective' in all areas, 'excellent' in some and is well placed to deliver continuous improvement throughout CP6.

2.22. Looking forwards, we had expected each route to demonstrate in its plan its approach to asset management. As a minimum, we had expected each route to demonstrate how it would operate in accordance within the requirements of ISO

[18] CP6 SBP AMEM Assessment version 1.0, Asset Management Consulting Ltd, 12 April 2018. This may be accessed here.

55000 (Asset Management) by the end March 2021, a requirement set by Network Rail's technical authority. We found that all routes have committed to improving their capabilities. Some are clearer than others in terms of matching ISO 55000 requirements with Scotland and South East committing to achieving this standard during CP6.

Table 2.5 - Route responses to requirement to meet ISO55000

Route	Commitment	Timescale
Anglia	Develop the Anglia asset management capabilities for maintenance operations and renewals activities to meet requirements of ISO 55000.	March 2021
LNE&EM	"Increased use of RCM, qualitative inspection technologies (especially in civils assets) and decision support tools (DSTs) (ORBIS) all produce better asset knowledge and develop optimised delivery and maintenance plans of critical assets to prevent failure. The work we are doing to implement quality systems (see section 8.6) and achieve ISO55001 compliance will help us improve the way we manage our assets on an ongoing basis."	Ongoing
LNW	The route will use the National AMEM assessment report to assist in identifying the areas of focus required to achieve ISO55000 compliance. It will then produce and complete an action plan to enable achievement of full certification to ISO55000 during CP6	End of 2019 for plan. No date for accreditation
South East	Identify competency gaps across all route roles involved in planning and delivery of the asset lifecycle and implement training where required. "In early CP6 we will achieve ISO55001 accreditation and continue to implement and build on this in CP6, ensuring line of sight from corporate objectives and organisational accountability."	CP6
Scotland	The route has committed to achieve asset management capabilities that demonstrate alignment to ISO55001 through independent certification or self-assessment.	End Sep 2019
Wessex	The route will grow its Asset Management Capability to ISO 55001 standard. It will ensure its staff have the expertise, resources and information necessary to be empowered and accountable in discharging their duties. It will keep developing a culture that encourages adaptive collaboration in all parts of the route to contribute to achieving our route Vision.	April 2021
Wales	A move towards certification to ISO55001 at a route level and an increase in training aligned to the AM role based competency framework. This will increase the capability in the route to maximise strategic opportunities when and where they arise	2024

Route	Commitment	Timescale
Western	Undertake a gap analysis of the route to the requirements of ISO 55000 and complete subsequent actions to achieve compliance during CP6.	End 2021

Workbank development

2.23. Maintenance and renewals workbanks for the control period have been developed by each route. In line with asset policies, workbanks have been prioritised against Network Rail's Corporate Risk Appetite Matrix (CRAM) in order of safety, performance, reputation and value.

2.24. We found that routes have developed their workbanks based on asset condition data. A significant factor in prioritising work was whether a scheme had been deferred from CP5. We found that all route plans had been reviewed by Network Rail's relevant technical experts (known as professional heads) in its technical authority (STE). Prioritisation decisions had also been peer-reviewed between different portfolios within route teams. This was designed to ensure a consistent approach across the asset categories and to ensure the highest priority items were included within the plan.

2.25. Routes had made their prioritisation decisions within Network Rail's internal CP6 policy guidance. Where funding was considered to be insufficient, the routes prioritised renewals based on minimum condition and legal requirements ahead of medium to longer term asset life sustainability. All routes stated that they could demonstrate a rigorous work planning regime for CP6 that managed the safety risk within the funds available.

2.26. The proposed asset plans have aligned with national policies and policy targets. Alignment has been primarily achieved through the use of the DSTs and measuring against trigger points for intervention. We also found cases where routes have used local knowledge to depart from national policies with work being planned on assets that would not technically meet the criteria for intervention.

Prioritisation across assets

2.27. Following the agreement of route expenditure assumptions, the prioritisation process across assets within routes followed a similar method to the workbank development. The directors of route safety and asset management (DRSAMs) hosted workshops with all the route asset managers (RAMs) and reviewed risk heat maps based on Network Rail's CRAM. These discussions allowed each RAM to highlight the key risks in their respective asset areas. Moderation of assumptions happened as a part of the discussion and individual asset categories with higher

residual risks were then reviewed and funding reallocated if it was considered appropriate. This was an iterative process during the compilation of the SBPs.

2.28. We found that each route had a robust process for developing the individual asset workbanks. The allocated funding envelope has required routes to prioritise work across asset types. Routes that have significant signalling requirements in CP6 have had to reduce spend on other assets to below recommended activity levels to accommodate the high unit costs of this asset.

2.29. Table 2.6 below is based on STE's assurance of routes' plans within the SBPs and highlights where Network Rail's overall assessment of the planned activity levels were beneath minimum advised levels to cover safety and performance risk. The "minimum" level was set by Network Rail at the CP5 activity level minus 20%. This is a simplistic but practical approach which we have accepted as a basis for reviewing the plans.

Table 2.6 - Network Rail ratings of asset management plans

	Track	Signalling	Level Crossings	Structures	Earthworks	Operational Property	Telecommunications	E&P	Tunnels	Drainage
LNE&EM	Green	Green	Green	Green	Red	Green	Green	Green	Red	Green
Anglia	Green	Amber	Green	Green	Green	Green	Green	Green	Amber	Red
LNW	Amber	Green	Green	Green	Red	Green	Green	Green	Green	Green
Western	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Scotland	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Wessex	Red	Green	Green	Green	Green	Green	Green	Amber	Green	Green
South East	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Wales	Green	Green	Green	Green	Red	Green	Green	Green	Green	Amber

Key
Green = activity levels are at or above STE minimum activity levels
Amber = activity levels are below minimum activity guidance, however the chosen work mix and related mitigations through maintenance address the shortfall
Red = activity levels below STE minimum guidance. Further mitigation required to address the risk

2.30. STE's assurance found shortfalls in renewals that has insufficient mitigation in place in the following areas:

(a) Track (Wessex route)

(b) Earthworks ((LNE&EM, LNW and Wales routes)

(c) Tunnels (LNE&EM)

(d) Drainage (Anglia)

2.31. In our draft determination we raised concerns over these issues as a part of our challenge to Network rail on asset sustainability (see 2.55). As part of its response, the affected routes put forward proposals to increase the level of renewals of relevant assets and STE has confirmed that the proposals are sufficient to remove the concerns which led to the 'red' ratings in Table 2.6. Our final determination provides for this work to be undertaken and we will review the relevant routes' delivery plans to ensure that the relevant items are included.

2.32. Weather resilience and climate change adaptation (WRCCA) is a key risk area due to the potential impacts of climate change on railway infrastructure. While not all routes face the same challenges in this area, we found that all have included WRCCA-related work in their RSPs. Generally we found that these investments are focussed on recovery of work deferred in CP5 (earthworks, drainage and structures) and on high priority interventions to manage safety and performance risk. Whilst some work is included in routes' workbanks, a further element (estimated by Network Rail at approximately £188m) relates to reactive recovery from the effects of storms and other extreme weather events on earthworks. This will be funded from route and/or centrally held contingent asset management funding.

2.33. All routes have significant volumes of drainage work to protect the stability of earthworks assets. In a number of routes we found that drainage work will be targeted on sites with a view to managing specific risks. As part of our review of this area we noted that Anglia route was initially unable to demonstrate adequately that track drainage would be targeted at the highest risk sites, as we would have expected. We will review this further as the route develops its CP6 workbanks and delivery plans in light of Network Rail's response to our challenge about asset sustainability (see 2.55), that allocated an additional £6.6m for drainage renewal in Anglia

2.34. For track, we found that route asset teams have developed their plans aligned to the national policy guidance and have prioritised renewals based on condition. Routes have demonstrated a rigorous work-planning regime that seeks to best manage the safety and performance risk within the funds available. However longer-term sustainability will deteriorate across all routes. This particularly affects South East and Wessex routes which have planned little or no high volume track renewals planned in CP6. The volume shortfalls in Wessex are because signalling renewals have been prioritised. We are pleased to note that this matter has been considered in Network Rail's response to our challenge about asset sustainability (see 2.65).

Route specific findings[19]

2.35. (Note that some of the concerns raised in this section have been considered in Network Rail's response to our challenge about asset sustainability. This is discussed later in this chapter).

Route	Finding
Anglia	Anglia has forecast volumes of activity for signalling and tunnels lower than the minimum advised by STE with reference to the DST. There are no significant works proposed in the plan to the major structures within the route, in particular to Somerleyton and Reedham swing bridges, Manea Bridges, Bishopsgate Goods Yard viaduct and Kew Bridge which are all approaching the end of their useful life. Anglia had no flood resilience drainage work planned and in general, drainage renewals were below expected levels. We found Anglia's plans did not adequately consider the potential impact of climate change. We are pleased to note that some of these matters have been considered in Network Rail's response to our challenge about asset sustainability (see Table 2.13). The introduction of new rolling stock on the route will present an unknown risk to the rate of infrastructure wear and tear.
LNE&EM	LNE&EM have planned volumes of earthworks and tunnel activity lower than the minimum recommended by STE with reference to the DST. We are pleased to note that this matter has been considered in Network Rail's response to our challenge about asset sustainability (see Table 2.13). In CP4 & CP5 works have been completed on a number of major structures in Hull and Selby swing bridges. Whilst major/critical structures and tunnels assets should be manageable in CP6, major capital interventions will be required in future control periods. The introduction of new rolling stock on the route will present an unknown risk to the rate of infrastructure wear and tear.
LNW	LNW have planned volumes of track and earthwork activities lower than minimum recommended by STE with reference to the DST. The principal load bearing elements (PLBE) condition score for structures is slightly below the national average. The CP6 plan for both overbridges and

[19] These are selected key points from our detailed reviews.

Route	Finding
	underbridges indicated a relatively high latent safety and performance risk that the route intends to mitigate this through increased reactive works. Although a stepped increase in vegetation spend through CP6 is planned, volumes are still below STE recommended minimum levels. The automatic train protection (ATP) system on the Chiltern line is approaching the end of its economic life and reliability and / or availability issues may begin to impact performance in CP6. We are pleased to note that this matter has been considered in Network Rail's response to our challenge about asset sustainability (see Table 2.13). Uncertainty of the scope of works to be undertaken at Euston as a result of the High Speed 2(HS2) project means that a renewals backlog recovery will need to be undertaken in CP6.
Scotland	Track volumes in Scotland are expected deliver short term marginal improvements in safety and performance. However similar levels of investment going forward will not be sufficient to sustain this improvement Structures containing high alumina cement (HAC) concrete may be a significant issue within the route, and should be kept under review. We are pleased to note that this matter has been considered in Network Rail's response to our challenge about asset sustainability (see Table 2.13). Ageing slab track on Glasgow commuter lines is increasingly difficult to manage, refurbishment options are still being considered. This needs further consideration in CP6 by Network Rail.
South East	Metallic structures are highlighted as a concern with expenditure insufficient to meet this asset group requirements. We are pleased to note that this mattes has been partially addressed in Network Rail's response to our challenge about asset sustainability but we consider that further action will be necessary to ensure that these structures are maintained effectively and economically over their future lives. The additional demands resulting from the Thameslink project and the resultant traffic increase will put pressure on the route in CP6. One of the sharpest rises in predicated track ballast deterioration in CP6 is in South East, which already has some of the worst ballast conditions in the country. The route has sought to protect switches and crossings (S&C) work, which should benefit performance in the short term. However this is not considered sustainable in the longer term.

Route	Finding
	There was a stepped increase in maintenance spend on vegetation management through CP6. However planned volumes are still below the required minimum volumes advised by STE with reference to the DSTs. We are pleased to note that some of these matters have been considered in Network Rail's response to our challenge about asset sustainability (see Table 2.13).
Wales	Wales have planned volumes of earthworks and drainage activity lower than the minimum recommended by STE with reference to the DST. We are pleased to note that this matter has been considered in Network Rail's response to our challenge about asset sustainability (see Table 2.13). The workbank did not contain all work items for Britannia Bridge. The budget for all these works was removed as the route has not been able to match funding commitments from the Welsh Trunk Road Agency, who have joint responsibility. The route had however made an allowance for some maintenance works in CP6 to reduce the impact of deferring the major intervention. This needs further consideration by Network Rail to arrive at an agreed long-term solution.
Wessex	Wessex have planned volumes of track and E&P activity lower than the minimum recommended by STE with reference to the DST. Track volumes are predicted to result in a slight reduction in compliance and performance in the short term. Similar levels of investment going forward may lead to significant degradation. We are pleased to note that this matter has been considered in Network Rail's response to our challenge about asset sustainability (see later).The route had taken into consideration the potential impacts of Crossrail 2, Woking Junction separation and capacity enhancements at Clapham Junction. Pending confirmation that each scheme will proceed, planned intervention at sites likely to be affected by these projects has been limited to only those necessary to maintain safety so as to ensure as far as possible that long-term value will be attained. Earthworks were also identified by the route as being less than the modelled minimum volumes. We are pleased to note that this matter has been considered in Network Rail's response to our challenge about asset sustainability (see Table 2.13). However Wessex has been unable to address the E&P under renewals within the funding available, planned mitigation having been put in place. The route has a number of critical structures, namely the Thames bridges. Although these are in generally good condition, all will require re-painting schemes in future control periods, probably CP8 onwards.

Route	Finding
	The introduction of two additional managed stations (Guildford and Clapham Junction) and the transfer of responsibility for Waterloo International Terminal to the route will require an increase in minor works and planned maintenance.
Western	Western's structures maintenance plan was considered insufficient to maintain a compliant structures assessment regime through CP6 (about 20 assessments short per year). The route has committed to addressing this shortfall. Out of 23 box girder bridges, three had planned renewals activity and seven had planned strengthening. Network Rail reported that it is developing a standard repair for these type of structure. We concluded that the plain line track renewals programme will be challenging as it was primarily based upon condition drivers on main line sites and high output islands which are likely to be an inefficient way of delivering the required outputs. The route will need to effectively manage this risk. The introduction of new rolling stock new rolling stock on the route will present an unknown risk to the rate of infrastructure wear and tear.
STE and other HQ functions	Network Rail has committed to developing a robust set of lineside Key Performance Indicators (KPIs) in CP6 including both leading and lagging indicators to ensure that planned volumes are delivered and the benefits of this work are captured. Network Rail has committed to introducing ways to better manage risks , including: • roll out of Reliability Based Maintenance • expansion of the use of Remote Condition Monitoring • baselining and development of staff technical competency frameworks • development of leading indicators to monitor and manage 'maintenance effectiveness'. We will continue to engage with Network Rail in all the above areas.

Allocation of resources between routes

2.36. In early preparations for its plans for England and Wales, Network Rail developed indicative allowances for each route based on a planning assumption of CP5 levels plus 15%. Once the SoFA had been finalised, Network Rail developed a methodology for allocating to each route the surplus between its original aggregate plan and the actual amount available.

2.37. This overall rebalancing methodology consisted of two components: the first prioritised routes for additional spending according to asset condition; the second prioritised routes according to Network Rail's assessment of the economic benefits of passenger travel. The combined effect of these two factors determined what share of the additional funding went to each route.

2.38. We have some concerns about the methodology used to calculate the economic benefit element of the prioritisation. In particular, how traffic growth was factored into the methodology and some of the technical aspects of the calculation itself. However, re-allocating funds using a revised methodology would be impractical at this stage of the planning process due to time constraints and may not have led to a significantly different outcome, as the overall result of the rebalancing exercise prioritised routes with older assets and more densely used passenger services.

2.39. We require Network Rail to develop, in consultation with routes and external stakeholders, a better methodology for any subsequent allocation of funds between routes both within and beyond CP6. We consider that this approach is the most reasonable way of addressing our concerns with the existing allocation methodology.

Central costs

2.40. Routes are not fully self-sufficient businesses and continue to rely on Network Rail's centrally provided functions for some services. These include: STE (the technical authority); Route Services directorate (delivery of plant and materials under national contracts); IP (project management of renewals); and support services (back office functions).

2.41. In broad terms routes contribute to central costs based on either their actual usage or in proportion to their size. This is discussed further in the support costs section of this document. We checked and found that the functions listed above have sufficient resources to meet routes' requirements over the course of CP6.

2.42. IP costs have been built into the unit rates that routes used to develop their Strategic Plans. The IP cost has been calculated as six-percent of the total unit rate. IP has used a planning assumption of one person being required for each £1.5m of investment to calculate its expected headcount rather than a bottom up plan. IP is responsible for delivering large volumes of work on behalf of routes and has a significant role to play in realising efficiencies through procurement and delivery. While we intend to focus our monitoring and engagement with routes in CP6, if we are not satisfied that routes are able to hold IP to account for its costs then we may change our approach to assessing IP.

2.43. We met with STE on three occasions as part of our review process. At these meetings we challenged its:

- performance of its overarching safety leadership role;
- proposed staffing numbers for CP6;
- costs and activities under the intelligent infrastructure workstream (including remote monitoring and electrical isolations);
- wider support activities in CP6; and
- proposed contractual relationship with partnering organisations.

2.44. In addition we sought and were given a commitment that STE will put in place mechanisms to ensure that sufficient resources will be made available to meet both its assurance function role and to act as an enabler for the routes to meet their business objectives and continuously improve cost, efficiency and performance. We concluded that pre-efficient costs for STE are a reasonable forecast of the cost of meeting performance requirements based on the approach taken.

Asset performance and asset sustainability

2.45. We examined three key measures to understand what level of asset performance and sustainability will be achieved by the level of proposed activity:

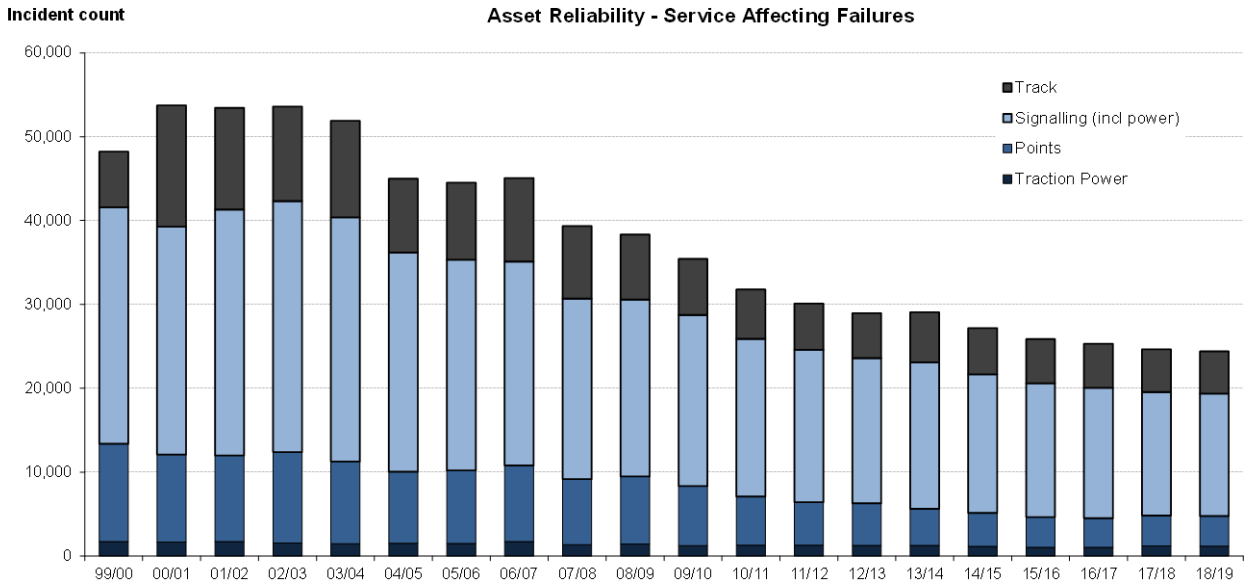
- service affecting failures, which measures the asset failures that most affect train service performance (i.e. punctuality and reliability);
- composite reliability index, which measures the improvement in asset reliability compared to 2013-14; and
- composite sustainability index, which is a high-level aggregate measure of asset sustainability.

Service affecting failures (SAF)

2.46. These are attributed to specific assets (track, points, signalling and traction power) and are measured as the count of unique incidents causing delay in a four-weekly reporting period (so that long-running temporary speed restrictions (TSRs) count multiple times). The threshold for delay is generally three minutes, but some one to two minute delays are attributed where required for performance management or attribution purposes.

2.47. Historical rates of SAF reduction have been up to 5% pa, although there are signs in CP5 that the fall in the rate is slowing (the rate having recently fallen to 3.4% pa (see Figure 2.1).

Figure 2.1 - SAF asset reliability trend



Source: Network Rail

2.48. We challenged Network Rail to compare the routes' SAF targets against its network-wide assessment to determine whether routes were within an expected range, cautious or lower than the expected level. STE undertook this work and its findings are shown in Table 2.7. The starting point for the assessment was an aspiration to achieve a 10% reduction over the control period but, with the exception of LNE&EM, Western and Scotland routes, this was not considered to be reasonably achievable due to the operational challenges they are facing in CP6. STE considered the routes' proposed reductions, and the challenges they face and formed an opinion on whether or not the proposed improvement was reasonable. Benchmarking across the routes showed further scope to improve in some routes, but also highlighted that observed differences were correlated to the age of assets (primarily signalling assets). This means that Network Rail's future rates of improvement are constrained by the rate of renewal of signalling assets.

Table 2.7 - Network Rail's view of stretch of route SAF targets

Route	Estimated achievable reduction	Achievability Ranking (see note below)	Proposed Reduction	Opinion	Comment
Anglia	8%	Moderate	3.0%		Lower than expected (by 5%)
LNE&EM	10%	Moderate	9.5%		Within expected range
LNW	8%	Moderate	4.9%		Cautious (within 3%)
Scotland	10%	Fair	9.6%		Within expected range

Route	Estimated achievable reduction	Achievability Ranking (see note below)	Proposed Reduction	Opinion	Comment
South East	5%	Hard	1.0%		Lower than expected (by 4%)
Wales	8%	Fair	8.1%		Within expected range
Wessex	8%	Moderate	4.9%		Cautious (within 3%)
Western	11%	Fair	11.4%		Within expected range

Note

Achievability category based upon current Mean Time Between Service Affecting Failures (MTBSAF) levels. Hard = improvement likely limited to 5%, Moderate = Improvement likely limited to 8%, Fair = improvement in range 8 to 15%.

Opinion category based upon, Red = proposed improvement significantly below estimated, Amber = proposed improvement below estimated, Green = proposed improvement in line with expected.

'Cautious' indicates that the route has taken a conservative approach.

2.49. Following the draft determination, we required Anglia, LNW, South East and Wessex routes to review their SAF trajectories and consider if route specific factors such as the impact of additional traffic and new rolling stock together with potential benefits from improvements to prevent asset failure had been fully reflected in their target setting. The routes all responded to the effect that they considered the trajectory of the targets to be both realistic and challenging and that no change should be made.

2.50. As SAF is a target set by Network Rail on route scorecards we have decided to accept its justification on this point. However we will review performance in this area and undertake benchmarking activities across routes during CP6. If it becomes apparent that the targets are not sufficiently challenging then we will re-open our dialogue at route level.

Composite reliability index (CRI)

2.51. This is a weighted measure of the percentage improvement in asset reliability compared to a 2013-14 baseline. CRI uses different weights for each "route criticality band" and "asset category" to differentiate between high and low impact failures, e.g.

- points failures have on average a 30% greater impact than the overall average impact, while Telecommunications failures have an impact 60% lower than the

overall average. Overhead Line Equipment (OLE) failures have the highest impact route criticality:

- points failures on Band one route sections have seven times the impact of failures on Band five sections. Band one routes being the most critical.

2.52. We required Network Rail to compare the RSPs against its network-wide assessment to determine whether the routes' targets were within an expected range, cautious or lower than expected level (see Table 2.8). Its analysis used accumulated knowledge from CP4 and CP5 together with an assessment of opportunities available to routes and the likely yield from the Intelligent Infrastructure programme. The levels of proposed renewal were identified within boundaries that allowed past patterns of change to remain a reasonable basis for development of a range of likely future outcomes. It also took into account revised allocations to routes to address known differences (especially in track age and condition).

Table 2.8 - Network Rail's view of stretch of CRI targets

Route	Estimated achievable reduction	Achievability Ranking (see note below)	Proposed Improvement	Opinion	Comment
Anglia	8%	Moderate	3%		Lower than expected (by 5%)
LNE&EM	9%	Moderate	9%		Within expected range
LNW	6%	Moderate	6.5%		Within expected range
Scotland	10%	Fair	9.6%		Within expected range
South East	5%	Hard	1%		Lower than expected (by 4%)
Wales	7%	Moderate	7%		Within expected range reflecting new population of OLE
Wessex	8%	Moderate	5%		Cautious (within 3%)
Western	8%	Moderate	7.5%		Within expected range reflecting new population of OLE

Note

Achievability category based upon current Mean Time Between Service Affecting Failures (MTBSAF) levels. Hard = improvement likely limited to 5%, Moderate = Improvement likely limited to 8%, Fair = improvement in range 8 to 15%.

Opinion category based upon, Red = proposed improvement significantly below estimated, Amber = proposed improvement below estimated, Green = proposed improvement in line with expected.

'Cautious' indicates that the route has taken a conservative approach.

2.53. Following the draft determination, we required Anglia, South East and Wessex routes to review their CRI trajectories and consider if route specific factors such as the impact of additional traffic and new rolling stock together with potential benefits from improvements to prevent asset failure had been fully reflected in their target setting. As with SAF targets, the routes all responded to the effect that they considered the trajectory of the targets to be both realistic and challenging and that no change should be made.

2.54. As CRI is also a target set by Network Rail on route scorecards we have decided to accept its justification on this point. However we will review performance in this area and undertake benchmarking activities across routes during CP6. If it becomes apparent that the targets are not sufficiently challenging then we will re-open our dialogue at route level.

Composite sustainability index (CSI)

2.55. A detailed description of the (CSI) and how it is calculated is set out in the scorecards and requirements document[20] and not repeated here.

2.56. While we expected some variation across routes and asset types, reflecting the timing of major works and differences in average asset life at the start of CP5, Network Rail's SBPs forecast a deterioration in asset sustainability for all routes.

2.57. Longer-term forecasts presented in the SBPs show continued deterioration (as illustrated in Table 2.9 and Table 2.10). This meant that assets would become less reliable over time and require greater interventions to address both safety and performance concerns if the deterioration was not addressed in the short term.

2.58. From our review of the process by which Network Rail established its workbanks and with our understanding of the CSI measure (including its limitations in terms of precision), we concluded that the predicted values are accurate and reflect the levels of activity planned in the SBPs. In the draft determination, we made it clear that this was not an acceptable position because:

- maintaining a sustainable asset base is vital to the interests of users and funders. It ensures the safety, reliability and value for money of the network over the long-term;
- in CP4, Network Rail deferred significant planned renewals, and did so again in CP5. We have previously raised concerns about this in our reporting and

[20] *Supplementary document - Scorecards and requirements,* ORR, October 2018. This may be accessed here.

reflected this in the advice we gave to the DfT and Transport Scotland in 2017[21]; and

- this advice was accepted by both governments, and was one factor behind the significant increase in funding made available to Network Rail.

2.59. Having arrived at this finding, we needed to estimate how much additional expenditure could bring asset sustainability up to an acceptable level. There was not time to undertake detailed analysis and so we undertook a high level estimate using the CSI. This has limitations as a measure because:

- it does not factor in the relative criticality of changes to different asset groups;
- the models cover the majority of areas of intervention on each asset but they do not cover every form of intervention; and
- the models have been developed to cover only the largest areas of spend / risk and asset population.

2.60. Initially, we sought to estimate the approximate magnitude of the additional expenditure that would be required to stabilise asset condition, as measured by CSI. We have taken this to be the level of additional expenditure required to keep CSI constant between the end of CP5 and the end of CP6. This totals £2,063m as shown in Table 2.11 and Table 2.12.

Table 2.9 - Change in CSI by route compared to end CP4 – SBP submission

Route	End CP5	End CP6
Anglia	-1.5%	-1.8%
LNE&EM	0.4%	-2.0%
LNW	0.2%	-3.6%
Scotland	3.0%	2.3%
South East	-2.0%	-4.3%
Wales	0.3%	-1.5%
Wessex	-2.3%	-5.4%
Western	2.3%	1.3%
National	**0.3%**	**-1.9%**
Source: Network Rail RSPs (route scorecards) Note: Anglia CSI scores for CP5 and CP6 updated May 2018		

[21] ORR's advice on the development of the England & Wales HLOS and SoFA, February 2017, available here.
ORR's advice on maintenance and renewals expenditure (to Transport Scotland), April 2017, available here.

Table 2.10 - Change in CSI by asset type – SBP submission

National	End CP5	End CP6
Track	-2.2%	-6.8%
Signalling	11.5%	-3.4%
Operational property	-0.1%	-10.4%
Telecommunications	-16.6%	-39.5%
Structures*	0.1%	0.9%
Earthworks	1.3%	-1.1%
Electrification &Plant	-5.2%	-8.4%

Source: Network Rail RSPs (route scorecards).

Notes

1 The May 2018 amendment to Anglia CSI included in the previous table has not been disaggregated. We anticipate that disaggregation would make a small change to the Operational; Property CSI value for CP6.

2 The CSI measure for structures will be based on using structures principal load bearing elements (PLBE). Previously, in CP5, it was based on the using average deck condition score (Bridge Condition Marking Index) and it is important that Network Rail continues to report to the ORR the average deck condition, along with the PLBE. This will allow comparison of the calculated Bridge Condition Marking Index (BCMI measure across control periods as well as continue monitoring the condition of the overall structures stock

2.61. To arrive at this total, we made an indicative estimate of the increase in work volumes required to maintain CSI through CP6. We did this by applying the following assumptions to Network Rail's levels of proposed activity by route and by asset category:

- Without any renewals at all Network Rail informed us that it would expect the annual decline of an asset to depend on its specific service life. For example, new telecoms may typically have an asset life of 15 years so would age by $^{1}/_{15}$ (6%) every year whereas new structures may have an asset life of 120 years so would age by $^{1}/_{120}$ (0.8%) every year.
- It would not be practical to calculate each individual asset separately so we have assumed an average life of all assets to be 50 years, then 1/50 (2%) of total value would be lost every year (10% over a five year control period).
- Not all assets are currently at the same stage in their lifespan so we have made a further assumption that, in general terms, the current remaining life of assets is at an aggregate level of half its lifespan (i.e. 50% of total value).

2.62. Table 2.11 sets out the results of our analysis, by route[22].

[22] The current models apply the actual national cost levels incurred in recent years (early CP5). Network Rail now have forecast costs for CP6 and it will be able to update and re-run the models. This is relevant as the model results are stated in remaining asset value and life.

Table 2.11 – Indicative increase in activity to maintain CP5 exit at CP6 exit by route – draft determination

CSI	CP6 Renewals Budget £m	CP6 CSI reduction %	Replaced %	Under %	Additional volumes required %	Additional £m
Anglia	£1,583	-2.7%	17.3%	2.7%	15.8%	£250
LNE&EM	£3,180	-2.4%	17.6%	2.4%	13.9%	£441
LNW	£2,735	-3.8%	16.2%	3.8%	23.6%	£645
Scotland	£1,817	-0.7%	19.3%	0.7%	3.7%	£67
South East	£2,132	-2.3%	17.7%	2.3%	12.9%	£275
Wales	£834	-1.7%	18.3%	1.7%	9.4%	£78
Wessex	£1,268	-3.1%	16.9%	3.1%	18.4%	£233
Western	£1,465	-1.0%	19.0%	1.0%	5.1%	£74
Total						**£2,063m**

Source: ORR estimate based on Network Rail data

Note The May 2018 amendment to Anglia CSI has not been disaggregated. We anticipate that disaggregation would make a change of c10% to the total figure.

2.63. In Table 2.12 we present the proportion of the proposed adjustment asset by asset. This is based on the expected change between the end of CP6 and the baseline. Where Network Rail has forecast an improvement in sustainability for an asset area in CP6 then no additional expenditure has been allocated. An example of this is switches & crossings within the track asset group.

Table 2.12 – Indicative increase in activity to maintain CP5 exit at CP6 exit by asset type, England &Wales - draft determination

	CP4 to CP6	% of Total	£m	Increase on CP6 SBPs
Track	-1.0	32%	664	15%
Signalling	-0.2	7%	135	2%
Operational property	-0.1	3%	68	7%
Telecommunications	-0.3	10%	201	25%
Structures	0.0	0%	0	0%
Earthworks	-0.5	16%	329	43%
Electrification &Plant	-0.8	26%	532	44%
Drainage	-0.2	6%	134	37%
All assets	-2.4	100%	£2,063m	11%

Source: ORR estimate based on Network Rail data

2.64. In respect of drainage, Network Rail does not have a reliable model. Instead our estimate is based on the 2017 Annual Return. For structures, Network Rail forecasted a zero percentage change to its CSI measure. Therefore, we would not expect this to be the focus of any additional activity. However, we consider there is a case that the metallic structures sub-class of this asset group should be

addressed due to the greater vulnerability of this asset to deterioration. As regards signalling and telecommunications, the analysis indicated a small increase. Given that Network Rail has already significantly increased spend in these two areas for CP6, we do not envisage that this should be the focus for any additional activity. We have not applied any relative criticality weightings between the asset types.

Network Rail's response to the draft determination

2.65. The foregoing analysis was set out in the draft determination and was broadly accepted by Network Rail. We required Network Rail to revise its plans in order to achieve an improved level of asset sustainability during CP6. In setting this challenge we accepted that the full level of work within out £2bn estimate was unlikely to be affordable and we asked the company to develop plans based on an assumption that £1bn could be found through savings elsewhere in the SBPs.

2.66. Although asset sustainability was the focus of our concern, we recognised that additional expenditure may bring other benefits such as improved performance and also that Network Rail should allocate funding and set its own priorities. We considered that this approach was important to maintain route level ownership of the resulting plans and that his would lead to better accountability for the outcomes.

2.67. Network Rail provided us with an interim response in July 2018. In this each route set out a prioritised list of additional work accompanied by estimates of the benefits in terms of changes to CSI outturns and other matters. We reviewed these proposals and concluded that they were based on reasonable assumptions and estimates and that they were likely to be deliverable in conjunction with the underlying programme of work set out in the SBPs.

2.68. Network Rail allocated funding across the routes by applying a modified version of the formula used when developing the SBPs. This produced a different spread of funding than we thought was needed based on Table 2.11 and Table 2.12. Nevertheless, we have decided not to change this allocation because of the factors referred to in paragraph 2.67 and because the allocation had been reviewed and agreed by the route directors of safety and asset management.

2.69. Network Rail's response to the draft determination clarified the shortcomings of the CSI methodology. It then refined its proposals in its formal response to the draft determination in August 2018. This proposal was based on:

- additional expenditure on renewals of £608m[23] (£538m for England & Wales and £70m for Scotland). This was based on the higher priority items from its July 2018 submission; and
- a technical review of the factors which affect long term asset sustainability and how these interact with the narrower measures used in forecasting CSI. Network Rail relied on this review to justify a lower level of additional work than had been indicated in the draft determination.

2.70. The technical review argued that long term modelling of asset condition underestimated (or excluded) the effect of a number of factors such as improved asset knowledge and monitoring, refinements to asset management policies arising from R&D and other improved technology, future efficiency improvements and other continuous improvements in asset management and engineering. It also emphasised that the models currently in use have limited precision and accuracy and that they have tended to produce cautious estimates in the past.

2.71. Network Rail also proposed that signalling asset renewals should be discounted in projections of medium and longer term asset sustainability. It suggested that this is justified by the uncertainty around unit costs linked to the digital railway programme and the need for significant increases in signalling renewals in future control periods.

2.72. Network Rail also suggested that asset sustainability forecasts would be improved if they took account of anticipated enhancement projects and probable expenditure of contingent asset management funding on treatment of failed assets. The company suggested that these factors may increase the proposed additional expenditure of £608m to above £1bn in CP6.

2.73. In its proposal, Network Rail confirmed that it had satisfactorily addressed the concerns about volumes which had led to the 'red' ratings in STE's assurance of the SBPs as shown in Table 2.6.

Our assessment of Network Rail's proposal

General comments

2.74. We have been persuaded by these arguments and we will therefore base our final determination on Network Rail's proposal to increase renewals by £608m. In reaching this conclusion we have noted the following:

[23] £608m includes £20m associated schedule 4 costs. The actual level of additional renewals will be net of these costs.

- the CSI calculation had a number of shortcomings and that we need to work with Network Rail to develop a new methodology. Network Rail having confirmed their commitment to doing so;
- the asset sustainability models are still relatively new in the context of overall asset lives, further calibration and development of the models is required by Network Rail in CP6;
- it is important that a long-term signalling strategy is developed to address the potential bow-wave of renewals as current systems reach the end of their economic lives and/or become obsolete. DfT has requested Network Rail to produce a digital railway implementation strategy and we expect this to inform longer term plans to manage maintenance, renewals and enhancement of signalling assets across all routes in England, Wales and Scotland;
- £608m represents the minimum level of planned additional expenditure and our conclusion is based on the expectation that enhancements and additional renewals supported by 'contingent asset management funding' will further improve asset condition;
- In the time available to respond to the draft determination, Network Rail was unable to provide a comprehensive assessment of the train performance benefits which will flow from the additional renewals. It is important that work continues to ensure that performance benefits are maximised within the objective of improving asset sustainability; and
- in the longer term, it is important that improvements in the measurement and modelling of asset condition are delivered in CP6 and that these, together with the long-term signalling strategy referred to above, are used to inform planning for CP7 and beyond.

2.75. Allocation of the additional renewals budget is shown in Table 2.13. The expected impact of this expenditure on CSI is shown in Table 2.14.

Table 2.13 – Additional asset sustainability funding

Route	CP6 Renewals budget BP Feb 2018 (pre efficient) £m*	Aug 18 Network Rail allocation to routes based on £608m £m	Total revised Renewals budget £m
Anglia	1,583	37	1,620
LNE&EM	3,180	123	3,303
LNW	2,735	136	2,871
Scotland	1,817	70**	1,887
South East	2,132	66	2,198
Wales	834	44	878
Wessex	1,268	83	1,351
Western	1,465	50	1,515
Total	**£15,014m**	**£608m (£538m for E&W)**	**15,622**

Source: ORR original estimate based on Network Rail data (rounded)

Notes
*A May 2018 amendment to Anglia CSI to remove assets leased to the train operator Greater Anglia was not disaggregated in the draft determination. We anticipate that disaggregation would have made a change of c-£200m for Anglia.
**For August 2018 Network Rail identified £70m for two areas – track and structures that required additional renewals funding in CP6. These additional items however have no material impact on sustainability as measured using CSI.

Table 2.14 – Anticipated change in CSI based on additional asset sustainability funding

Route	SBP End CP5	SBP End CP6	Impact of £608m End CP6
Anglia	-1.5%	-1.8%	-1.8%
LNE&EM	+0.5%	-2.0%	-1.6%
LNW	+0.2%	-3.6%	-3.5%
Scotland	+3.0%	+2.3%	+2.3%
South East	-2.0%	-4.3%	-3.9%
Wales	+0.3%	-1.5%	-0.9%
Wessex	-2.3%	-5.4%	-4.8%
Western	+2.3%	+1.3%	+1.6%
Great Britain	**+0.3%**	**-1.9%**	**-1.6%**

Additional renewals supported by contingent asset management funding

2.76. In our initial analysis, we estimated that circa £2bn of additional renewals would be required to maintain CSI at the level where it is anticipated to be at the end of CP5 and that circa £1bn would be needed to hold CSI at the minimum acceptable level.

2.77. The arguments which we have accepted will reduce the minimum additional asset sustainability expenditure in CP6 to £608m. They will also reduce the amount of additional expenditure which would be necessary to maintain asset sustainability at CP5 exit levels. However, Network Rail should seek to further improve the position if additional funds become available within the overall settlement. We accept that Network Rail has to balance this against other aspects of delivery.

2.78. We therefore require Network Rail to use those elements of the group portfolio Fund which have been re-allocated to routes to plan additional renewals which could be supported by 'contingent asset management funding' with a view to improving asset sustainability if risks do not materialise or if calls on risk funding are less than anticipated.

2.79. Further efficiency savings and any unused parts of the centrally managed group portfolio fund should be used to support improvements to asset sustainability, train service performance or other business needs based on Network Rail's own prioritisation processes, which we will monitor.

2.80. If funds become available for additional renewals, we would like to see greater transparency around the process used to allocate these between and within routes so that investment is targeted at the areas of greatest need. This is consistent with our requirement that Network Rail should develop a better method of allocating funds between routes. Network Rail should seek stakeholder views when developing this process.

2.81. This process to improve the allocation of funds needs to be in place towards the start of the first year of CP6, so that it can be applied to the first update of business plans during CP6.

2.82. We maintain our view that Network Rail should use the planning of additional renewals which could be supported by 'contingent asset management funding'[24] in England & Wales as a tool to ensure that such funding can be deployed to improve asset condition without undue delay. We expect that such schemes would generally comprise work that was deferred from CP5 due to unaffordability or brought forward from CP7 and so any subsequent deferral would delay the longer-term improvement in asset sustainability without creating significant adverse impacts within CP6.

Incremental benefits from the renewals programme

2.83. Responses to the draft determination drew attention to Network Rail's practice of including opportunistic capacity upgrades in selected renewals projects. This is sometimes referred to as 'renewals plus' and can deliver improvements in network capacity at a marginal cost. Respondents expressed concern that the separation of

[24] 'Contingent asset management funding' is uncommitted risk monies held within routes.

enhancement and renewals funding coupled with a focus on efficiency may disincentivise Network Rail from undertaking 'renewals plus'.

2.84. It is not our intention that where opportunities arise for capacity upgrades that they should not be exploited, however they must be clearly delineated from the planned core work. The effects of altering the scope and cost of renewals is discussed in our conclusion document on how we will assess Network Rail's efficiency and financial performance in CP6[25]. We require Network Rail to develop a mechanism to report any changes to the scope or cost of renewals, to ensure that efficiencies are reported clearly and accurately. We will continue to engage with Network Rail in the lead up to the start of CP6 to agree a mechanism which provides sufficient transparency of efficiencies and does not distort decisions about the realisation of incremental improvements.

2.85. Where such incremental upgrades are undertaken, we expect relevant stakeholders to have been consulted and there to be a positive business case for the extra expenditure.

Conclusions

2.86. Network Rail's route plans are much improved from previous reviews, based on improved asset data and factoring in a knowledge of local risks. There is clear evidence that the routes have spent significant time and resource developing and optimising plans within funding constraints, making trade-offs and balancing resources. We found specific examples where local knowledge has been used to justify departures from national policies.

2.87. WRCCA will require further consideration in CP6 as knowledge in this area develops. We will monitor Network Rail development of its WRACCA strategy and polices in CP6 to reflect these changes in order that that they can be better reflected in renewal planning for CP7 and beyond.

2.88. We have concluded that there is a high degree of commonality between the routes in terms of asset data, with all detailing an increased focus on asset data management through continued implementation of the asset data governance framework. However, in CP6 we expect Network Rail to maintain its focus on achieving A2 data quality across all business critical asset data. This should incorporate the new Minimum Asset Data Requirements (MADR) that have been defined to establish a process for the Exchange of Asset Information (EAI) to keep asset data up to date. Particular focus should be given to the implementation of CSAMS to ensure the benefits of this project can be realised and the remaining core attributes from CP5 be bought up to the required standard. Network Rail is

[25] Our approach to assessing Network Rail's efficiency and wider financial performance in CP6 – conclusions, ORR, 12 June 2018. This may be accessed here.

required to submit a plan for our approval by the start of CP6 setting out how it will meet these requirements along with key milestone dates for their implementation. Our expectation is that these items will be delivered early in CP6.

2.89. Furthermore, we will monitor Network Rail to ensure that focus on the governance processes introduced in the ADG project is maintained, and that procedures such as the National Community of Practice, route-level data communities, and the action plans developed to date are implemented throughout CP6 in order to promote best practice in the area of asset data management.

2.90. All of the routes are committed to improving their capability, although only two routes (Scotland and South East) have committed to achieving the standards required by ISO55000. We required that Network Rail puts in place effective reporting against progress along with sufficient oversight of the progress being made by all routes. As a minimum, each route is required to demonstrate to our satisfaction that it is operating in accordance within the requirements of ISO 55000 (Asset Management) by the end of March 2021.

2.91. A reasonable approach has been adopted for determining workbanks with a clear rationale presented for the prioritisation between assets and between routes. We found that route asset teams have sought alignment with asset policies but have prioritised renewals based on condition and structural capacity / legal requirements at the expense of sustainability.

2.92. For asset reliability and impacts on train services most routes have targeted levels that would be expected with the levels of work. However, we consider that Anglia and South East route have been cautious in preparing their estimates of what can be achieved. We will review performance in these area and undertake benchmarking activities across routes during CP6. If it becomes apparent that the targets are not sufficiently challenging then we will re-open our dialogue at route level in CP6.

2.93. We considered that the deterioration in asset sustainability forecast in the SBPs was unacceptable. Network Rail's routes have proposed a package of additional renewals costing £608m (£538m in England & Wales, £70m in Scotland) which is forecast to provide a CSI level at 1.6% below the end of CP4 at the end of CP6. We have accepted the technical arguments which support this proposal and we are therefore including these proposals in our final determination.

2.94. We require that routes prioritise their additional renewals to satisfactorily address the concerns about volumes which had led to the 'red' ratings in STE's assurance of the SBPs as shown in Table 2.6.

2.95. The increased level of renewals is still expected to lead to a fall in asset sustainability as measured by CSI. We require Network Rail to seek opportunities to

improve this position and this should include planning of additional renewals which could be supported by 'contingent asset management funding' so that any additional funding released by better than expected levels of efficiency or from unused risk funding can be deployed to best effect without delay.

2.96. It is important that a long-term signalling strategy is developed to address the potential bow-wave of renewals as current systems reach the end of their economic lives and/or become obsolete. DfT has requested Network Rail to produce a digital rail implementation strategy and we expect this to inform longer term plans to manage maintenance, renewals and enhancement of signalling assets across all routes in England, Wales and Scotland;

2.97. Ageing slab track on Glasgow commuter lines is viewed as being increasingly difficult to manage. This will require further consideration in CP6 by Network Rail.

2.98. We have noted routes concerns regarding their resources to adequately deliver the whole life management of metallic structures. We require Network Rail to develop a sustainable asset strategy for future control periods, similar to that produced for earthworks and drainage in CP6. In addition we require that Network Rail continues to report average deck condition score (Bridge Condition Marking Index) to the ORR the average deck condition, along with the PLBE. This will allow comparison of the calculated Bridge Condition Marking Index (BCMI measure across control periods as well as continue monitoring the condition of the overall structures stock.

2.99. Network Rail has committed to the development of a robust set of lineside KPIs in CP6 including both leading and lagging indicators to ensure that planned volumes are delivered and the benefits of this work are captured. We will continue to work with Network Rail to align monitoring work in this area.

2.100. We also require Network Rail to improve:

- its approach to prioritising funding across routes and asset groups so that future funding decisions better target where investment can be used to best effect; and
- how asset sustainability is measured – specifically, we require an improved measure to supplement or replace CSI.

2.101. We do not intend that our final determination should prevent Network Rail from continuing to improve network capacity by undertaking 'renewals plus' to secure benefits at marginal cost. We expect Network Rail to develop proposals for measuring efficiency in CP6 that will include arrangements to recognise such works.

Cost planning and estimation

Assessment criteria

2.102. The following questions framed the assessment for this area:

- is the pre-efficient cost of maintenance and renewals reasonable, based on good estimating practice which reflects the conditions under which the work will be delivered?
- where applicable, are central costs included in route budgets for renewals reasonable, based on good estimating practice and is the method of apportionment transparent and reasonable?
- is the basis for risk allowances in renewals costs clear, are allowances appropriate and coordinated with Network Rail's overall approach to risk (via the PR18 financial framework workstream)?

Maintenance

Methodology

2.103. Broadly, Network Rail delivers maintenance of track, signalling, E&P and off-track asset categories using in-house resources supplemented by external contractors where activities are either specialised or where this is appropriate to manage fluctuations in workload such as seasonal tasks. Maintenance-related costs within the SBP submission are summarised in Table 2.15.

Table 2.15 - Maintenance costs in the SBPs

Category	Pre-Efficient £m	Additional Headwinds £m	Efficiencies £m	CP6 Total £m
MDU Maintenance	5,799	69	(259)	5,610
Non MDU Maintenance	913	124	(217)	820
Reactive Maintenance – Buildings	487	2	(12)	477
Reactive Maintenance – Structures	394	-	(10)	384
Reactive Maintenance – Earthworks	73	-	(2)	72
Total Maintenance Costs	**7,666**	**95**	**(499)**	**7,362**
Source: Network Rail (SBP CP6 Consolidated Opex workbook – Total Opex) 2017-18 prices (rounded)				

2.104. The maintenance costs shown above account for 54% of the controllable opex total of £13,556m (the balance of £6,194m is for operations and support costs which are considered later in this document).

2.105. Our review has mainly been based on desktop analysis of the SBPs and is informed by the independent reporter study of SBP planning assurance[26] and by the benchmarking work reported in the econometric benchmarking report.

Findings

2.106. Network Rail delivers infrastructure maintenance through its MDUs. Some other maintenance works are delivered by 'works delivery units'. The SBPs do not consistently differentiate between these units when presenting maintenance costs and we have followed their categorisation in this section.

2.107. Table 2.16 shows how MDU-delivered maintenance costs are allocated. £5,502m (98%) is estimated by routes using the ABP tool with the balance (£108m) included under the headquarters 'Group' function, which covers:

- an extra payroll day not reflected in ABP models; and
- £30m for a maintenance reorganisation in year 2.

2.108. We questioned the basis of the £108m expenditure in the 'Group' function and received a satisfactory explanation as follows:

- The additional payroll day is required to provide for an anomaly between payroll costs used in the ABP tool which are based on 13 28-day periods (364 days) and a 365 day calendar year.
- The re-organisation allowance facilitates the realisation of efficiencies.

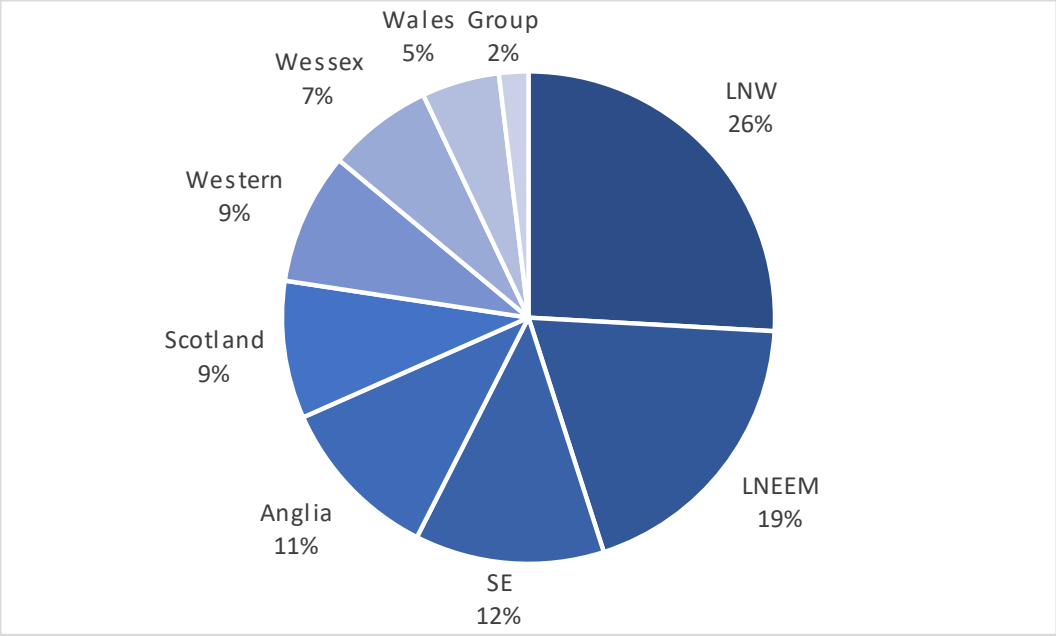
Table 2.16 - MDU maintenance costs by business unit

Category	Pre-Efficient £m	Additional Headwinds £m	Efficiencies £m	CP6 Total £m
Anglia	635	11	(35)	611
LNE&EM	1,115	23	(63)	1,076
LNW	1,468	-	(16)	1,452
SE	745	15	(63)	697
Wales	290	-	(4)	286
Wessex	415	9	(35)	389
Western	516	10	(42)	485
Scotland	507	-	-	507
Route sub-total	**5,691**	**69**	**(259)**	**5,502**
Group	108	-	-	108
Total	**5,799**	**69**	**(259)**	**5,610**
Source: Network Rail (SBP CP6 Consolidated Opex workbook – Total Opex) 2017-18 prices (rounded)				

[26] *PR18 SBP Planning Assurance Mandate – Main Report (Reference L2Ni007)*, Nichols Group Ltd, 26 September 2017. This may be accessed here.

2.109. The relative size of each business unit's MDU maintenance activities is illustrated in Figure 2.2

Figure 2.2 - MDU maintenance costs by business unit



2.110. The £5,502m post efficient cost of route based MDU maintenance is estimated using the spreadsheet based ABP tool for each delivery unit. Total costs and other related data are consolidated by Network Rail's Business Review Team. There are 39 MDU units as shown in Table 2.17.

Table 2.17 - ABP estimated maintenance costs by route and unit

Route	MDU	MDU estimated maintenance costs £m	Route estimated maintenance costs £m
Anglia	Ipswich	140	611
	Romford	182	
	Tottenham	173	
	Anglia HQ	115	
LNE&EM	Bedford	115	1,077
	Derby	187	
	Doncaster	109	
	Leeds	120	
	Newcastle	156	
	Peterborough	142	
	Sheffield	111	
	York	136	
LNW	Bletchley	168	1,452
	Lancashire & Cumbria	238	
	Liverpool	260	
	London Euston	160	

Route	MDU	MDU estimated maintenance costs £m	Route estimated maintenance costs £m
	Manchester	173	
	Saltley	156	
	Sandwell & Dudley	140	
	Stafford	141	
	LNW Works Delivery	15	
SE	Ashford	129	697
	Brighton	148	
	Croydon	149	
	London Bridge	163	
	Orpington	108	
Wales	Cardiff	180	286
	Shrewsbury	108	
Wessex	Wessex Inner	203	388
	Wessex Outer	185	
Western	Bristol	119	485
	Plymouth	96	
	Reading	149	
	Swindon	121	
Scotland	Edinburgh	140	508
	Glasgow	80	
	Motherwell	146	
	Perth	97	
	Scotland Works Delivery	44	
Total		**5,502**	**5,502**
Source: Network Rail (GB Consolidated Total Costs - Activity Based Planning workbook			

2.111. Excluding the two route works delivery units in LNW and Scotland and the Anglia HQ which are atypical, the size of MDUs expressed in terms of turnover in CP6 varies from £80m to £260m. We have sought to investigate if variances in MDU size or other factors may affect the efficiency of maintenance delivery.

2.112. Econometric benchmarking provided some evidence on the relative efficiency of MDUs and that there are significant opportunities for efficiency improvements. More details are set out in our separate technical paper on econometric benchmarking.

2.113. We undertook further analysis to try to identify the high-level drivers of cost in MDU-delivered maintenance. This comprised:

- a review of possible links between labour rates and the notional efficiency levels identified by the benchmarking study; and
- a review of links between measures of productivity and notional efficiency.

2.114. Neither approach produced a complete explanation of the variance in efficiency identified by the benchmarking study. We therefore concluded that further work will need to be done in CP6 to develop metrics to understand the efficiency of MDU-delivered maintenance.

2.115. The remainder of our findings therefore concentrate on the ABP tool and the bottom-up estimates prepared to support the SBPs.

2.116. The ABP tool is a recent innovation and is a positive step towards better transparency and understanding of maintenance costs. Through this, the tool provides an enhanced ability to improve efficiency in the planning and delivery of maintenance.

2.117. The independent reporter review of Network Rail's business planning process[27] considered its use of the ABP tool. The report was supportive of the value and future potential of the ABP tool in managing maintenance activities and costs. This review took place during an early stage of development of the SBPs and recommended that assurance of the following matters should be considered in connection with the SBPs. These being:

- how resource levels are planned;
- the balance between required and actual resource levels;
- that any mobilisation or demobilisation costs are covered; and
- that any changes in Non Time-on-Tools (NTOT) levels are justified by efficiency plans or similar initiatives.

2.118. Network Rail responded positively to these findings and we found that the first three items were taken into account in the SBPs. Network Rail has committed to develop the model to provide greater transparency of the rationale for NTOT.

2.119. Despite these developments, we had concerns about the results of Network Rail's assurance review of the ABP models used in preparing the SBPs. The assurance was based on scoring the ABP models in terms of:

- completeness;
- commentary;
- deliverability; and
- strategic alignment with the relevant route strategic plan.

2.120. The scoring system used by Network Rail was not completely consistent across these criteria but, in general terms, a rating of less than 3 out of 5 (60%) indicates

[27] *PR18 SBP Planning Assurance Mandate – Main Report (Reference L2Ni007)*, Nichols Group Ltd, 26 September 2017. This may be accessed here.

potential grounds for concern. Network Rail's assurance ratings are shown in Table 2.18. There are extensive ratings of 60% or less.

Table 2.18 - Network Rail assurance of ABP submissions

Route / Unit	1: Completeness	2: Commentary	3: Deliverability	4: Strategic Alignment	Weighted Overall Score (%)
Anglia					
Ipswich	100%	66%	69%	24%	58%
Romford	100%	58%	61%	26%	53%
Tottenham	100%	68%	63%	23%	56%
LNE&EM					
Bedford	100%	64%	63%	54%	63%
Bletchley	100%	45%	50%	33%	47%
Derby	100%	64%	67%	37%	60%
Doncaster	100%	56%	68%	37%	58%
Leeds	100%	57%	63%	53%	60%
Newcastle	100%	53%	65%	59%	61%
Peterborough	100%	40%	37%	35%	41%
Sheffield	100%	70%	72%	36%	64%
York	100%	61%	57%	37%	56%
LNW					
Lancashire and Cumbria	70%	34%	39%	58%	44%
Liverpool	70%	24%	19%	42%	29%
London Euston	100%	20%	22%	16%	24%
Manchester	70%	43%	44%	35%	43%
Saltley	100%	50%	44%	23%	44%
Sandwell and Dudley	100%	54%	48%	34%	49%
Stafford	100%	74%	61%	14%	56%
Scotland					
Edinburgh	100%	53%	48%	29%	48%
Glasgow	100%	47%	45%	30%	45%
Motherwell	100%	56%	50%	32%	50%
Perth	100%	52%	48%	30%	48%
Wales					
Cardiff	100%	60%	56%	38%	55%
Shrewsbury	100%	63%	64%	38%	59%
Wessex					
Wessex Inner	100%	52%	55%	11%	45%
Wessex Outer	100%	60%	68%	8%	52%
Western					
Bristol	100%	61%	53%	30%	52%
Plymouth	100%	66%	57%	27%	55%
Reading	100%	58%	58%	40%	55%
Swindon	100%	49%	42%	61%	52%

Route / Unit	1: Completeness	2: Commentary	3: Deliverability	4: Strategic Alignment	Weighted Overall Score (%)
South East					
Ashford	100%	60%	59%	22%	52%
Brighton	100%	58%	64%	34%	56%
Croydon	100%	69%	71%	39%	64%
London Bridge	100%	46%	48%	53%	51%
Orpington	100%	39%	33%	24%	36%
Average	**98%**	**54%**	**54%**	**34%**	**51%**
Source: Network Rail					

2.121. ABP-generated costs are largely, but not entirely, driven by the cost of directly employed staff, so we think that the volume of work to be delivered may be more at risk from the assurance ratings than overall cost but further work will be necessary ahead of CP6 to fully understand the risks associated with this matter.

2.122. We expect to see much greater quality and consistency in the use of the ABP tool before and during CP6. We expect that this will assist in improving the understanding of maintenance cost drivers and supporting meaningful benchmarking between units.

2.123. Network Rail should progress and complete the development of a model to support the understanding and management of NTOT within MDU delivered maintenance activities.

2.124. During CP6, we expect to see evidence that Network Rail is using enhanced tools and understanding of relevant drivers to demonstrate significant improvement in the consistency and level of productivity across all MDUs. We would expect to see that any use of the reorganisation budget supports this objective.

Renewals

Methodology

2.125. It is important distinguish between:

- longer-term trends on efficiency: our ongoing monitoring and 2017 review of renewals efficiency[28] highlights the longer-term decline in Network Rail's efficiency levels.
- evidence on current unit costs: we have reviewed the process by which Network Rail has determined the appropriate baseline level of costs, which are then used to understand the likely cost of delivering its plans in CP6; and

[28] *Improving Network Rail's Renewals Efficiency: a consultation*, ORR, July 2017. This may be accessed here.

- evidence on cost pressures and opportunities: we have reviewed how the current unit costs are likely to change over time, in response to future cost pressures and opportunities for cost savings.

2.126. Our review of renewals costs has focused, in particular, on the latter two sources of evidence on efficiency, as these are the areas that are most likely to provide quantitative evidence of future efficiency levels.

2.127. Against this background, we considered three aspects of Network Rail's renewals cost planning. These were:

- assessment through the current control period of its Cost Planning Improvement Programme (CPIP), this provides some assurance about future cost trajectories, while not providing an estimate of efficiency savings in itself;
- review of the assurance activities that Network Rail has undertaken to check the quality of its cost planning for its submission to us; and
- commissioning a study by Gleeds, (an independent consultant), to assess the quality and robustness of the exercise that the routes have undertaken to develop their pre-efficient unit rates.

Cost Planning Improvement Programme

2.128. We have been monitoring the delivery of this programme and reporting on its achievement of milestones in the Network Rail Monitor. The programme was a workstream included by Network Rail in its enhancement improvement programme (EIP) in response to ORR finding Network Rail in breach of its licence in November 2015.

2.129. The programme also has relevance for renewals. CPIP has put in place a new structure for the cost planning function in Network Rail and has introduced new processes, procedures, and technology to support improved cost planning. Although the programme had not delivered all its outputs in time for the submission of SBPs, we have observed that mitigating measures had been put in place by Network Rail, including backfilling staff vacancies using contingent labour, to give a level of confidence that Network Rail's costs planning capability has improved since PR13.

Monitoring of Network Rail's Assurance

2.130. We have undertaken monitoring of Network Rail's assurance throughout the development of its business plans and have challenged Network Rail on its level of maturity leading up to PR18. We received from Network Rail assurance reports undertaken independently of the routes by Infrastructure Projects for each round of its business planning cycle, including the round that was used as an input to its SBPs.

Gleeds analysis

2.131. We commissioned Gleeds (published alongside this document[29]) into route specific inputs to the SBPs (the pre-efficient costs). Consistent with our approach to assessing Network Rail's efficient costs we have taken a risk-based approach to this assessment. This led us to focus Gleeds' attention on six routes: South East; Anglia; Wales; Scotland; London North West; and London North East & East Midlands. Within those routes we asked Gleeds to investigate five asset types:

- drainage;
- signalling;
- earthworks;
- track; and
- electrification & plant

2.132. We asked Gleeds to assess whether the rates used by Network Rail had a robust evidence base, whether risk had been treated appropriately, including checking that there is no double counting of risk, and whether Network Rail had given due consideration to the inefficiencies associated with the delivery of renewals in the current control period (i.e. CP5).

2.133. The latter concern arises because during CP5 (2014-2019) there were a number of shocks to Network Rail's Capital Delivery Portfolio (see our July 2017 consultation[30] for further details). These shocks have required work to be re-planned leading to additional costs and we are concerned that such one-off factors should not be consolidated into the cost base for CP6.

Findings

2.134. Overall we have found that Network Rail has improved its cost planning capabilities since the start of CP5. Its own assurance of the route plans covered all routes and all asset types.

2.135. Gleeds identified that the approach used by routes for renewals cost estimating was generally based on *volume x unit rate = cost* as opposed to a more detailed bottom-up methodology. Establishment of the volumes used is discussed under asset management in previous sections and so the focus for Gleeds was to understand the evidence for the derivation of the rates used and to understand whether these reflect what the work should cost, having normalised for one off events, or whether

[29] *PR18 Efficient Costs Project – Renewals Cost Planning Review (IFRA0083)*, Gleeds Cost Management Ltd, May 2018. This may be accessed here.
[30] *Improving Network Rail's Renewals Efficiency: a consultation*, ORR, July 2017. This may be accessed here.

they simply reflect actual cost of current work. Gleeds also checked if the rates excluded excessive risk or contingency above the level necessary to achieve an approximate P_{50} confidence level across the portfolio of work[31].

2.136. The review undertaken by Gleeds found the following:

- Track, has seen the most consistent calculation across the routes. Track renewals are mostly delivered by a central team within Infrastructure Projects. Routes have used centrally provided rates and have shown a good level of evidence where they have departed from these rates. Financial year 2016-17 data has been used for the baseline as Network Rail considered that this provides a good indication of the current cost of delivery.
- Signalling, routes have used a national tool known as the Infrastructure Cost Model (ICM). They have shown a consistent approach to using this model with the exception of Anglia which has used a bespoke model for establishing its CP6 base cost (the ICM has been used by Anglia to support its post-efficient cost base).
- Electrification and Plant, has shown some evidence of centrally-derived rates but the routes have generally used locally benchmarked rates and have varying degrees of evidence to support them. The variety of asset types within this asset type has meant that the routes have shared information on costs incurred in CP5. This has led to some routes including uncertainty within their rates to get them to an approximate P_{50} confidence level (see below).
- Drainage, is a relatively new asset category for Network Rail (having previously been treated as part of other assets). Historically the cost of drainage has been contained within track and earthworks costs. This has meant that breaking out drainage specific unit rates has been difficult for some routes. Our review of asset management indicated that Network Rail's asset knowledge in drainage lags behind other asset groups with basic information such as location and type often being unknown. Therefore volumes and rates have been based on engineering judgment and historical work-patterns. This asset type has consequently seen the most variability between routes in both approach and benchmarks. There is, therefore, additional potential for outturn unit costs to differ from those underlying the business plans.

2.137. Schedule four costs (costs paid to operators for access to the network at planned times of disruption) have not been included within the pre-efficient rates. Allowances for these costs are made elsewhere in the SBPs.

[31] P_{50} is a risk analysis term meaning a cost point which is just as likely to be exceeded as to be improved upon.

2.138. Each route has a differing level of evidence base for the unit rates which they have used but there is not been enough evidence for us to identify specific errors in overall levels of estimated cost.

2.139. As noted above, there were shocks to Network Rail's renewals portfolio in CP5 and these led to increases in unit rates as a result of inefficient working. The Gleeds review did not lend itself to a detailed examination of how the rates selected by Network Rail have been normalised to exclude such one-off factors and, we have not seen conclusive evidence that Network Rail has removed all the one-off inefficiencies from base rates derived from affected CP5 projects.

2.140. While the routes have reviewed centrally-provided unit costs, the incentives between these parties are largely aligned and this minimises the level of challenge that may be expected. The cross-check by routes would not therefore be expected to remove any additional costs in the baseline unit costs.

2.141. This means that overall we do not have sufficient assurance that the base unit rates are not higher than we would expect Network Rail to achieve, now that the context for its planning and delivery of work is significantly improved relative to the situation in CP5. These findings influence our view of the scope for a greater efficiency challenge for Network Rail in CP6.

Basis of risk allowances

2.142. Network Rail has applied an uncertainty factor of 60% for schemes at an early stage of development. This is normal practice for any scheme that is standalone and would be intended to give a cost certainty rating in the order of 80% (P_{80})[32].

2.143. However, the basis of costing for Network Rail's overall portfolio of renewals work should be at the equivalent of P_{50}. This should be the basis for the rates used to get to the final pre-efficient cost.

2.144. The majority of the schemes currently within Network Rail's renewals plans are at an early stage of development. From the evidence presented by Network Rail, Gleeds concluded from the schemes that it had seen that Network Rail has included for risk funding at a scheme level, in electrification & plant, earthworks, and drainage. This indicates that risks have been double-counted, i.e. included in both the pre-efficient cost base and in risk funding.

2.145. Gleeds observed that it did not have evidence such double counting is a systemic issue. Gleeds also considered that the evidence it had collected did not demonstrated that Network Rail had included material amounts of provision for risk or uncertainty over and above what would be required to fund the entire portfolio to P_{50} in these asset categories. Given the evidence available, we do not have

[32] P_{80} is a risk analysis term meaning a cost point that is unlikely to be exceeded 80% of the time.

sufficient data to estimate the actual level of over provision in Network rail's estimates. However, this uncertainty highlighted the opportunity for efficiency savings beyond those identified in Network Rail's SBPs.

2.146. A report undertaken for ORR by Cambridge Economic Policy Associates (CEPA)[33] concluded that Network Rail has used the outturn costs of work carried out during the first three years of CP5 as the basis for the rates to be used in CP6. This is consistent with the evidence provided to Gleeds as part of its study. As noted above, there have been a number of cost shocks to the portfolio which may mean that unless fully normalised the rates used will have inefficiency included in the outturn costs.

2.147. On examination of the rates provided by the IP cost planning function to the routes we have seen evidence that a process has taken place to account for the inefficiencies encountered during CP5. However, the evidence has not provided assurance that this normalisation has removed all of the inflated costs in the CP5 historical data, even accounting for inherent difficulties in quantifying these impacts to a high level of accuracy. We have concluded that there has been systematic bias in the preparation of unit costs: namely that where unit costs have been estimated from outturn costs in CP5, that are substantially above the long-term efficient level, it is probable that the impact of current inefficiencies has not been adequately reversed out.

2.148. Routes have used these rates as a starting point for their cost planning and have also used locally derived rates based on CP5 activities to adjust the rates used in their submissions. We have seen some evidence that the adjustments which routes have made to the centrally provided rates have taken account of CP5 cost outliers. So, where unit rates have been very high or very low they have been excluded from the analysis). This gives a rate that the routes consider supports an approximate P_{50} confidence level. We have also seen evidence that the leadership within the routes has provided a top-down challenge. While this mitigates some of the risks noted above, our view is that this process is unlikely to have fully normalised unit costs.

Conclusions

Maintenance

2.149. Network Rail's assurance of the ABP tool in preparing the SBPs highlighted some specific concerns over the quality of the maintenance plans. However the majority are above average and close to required levels. There may be a risk to the successful delivery of planned workbanks across the maintenance organisation

[33] *Review of Network Rail's approach to Financial Risk Assessment and Management in its Strategic Business Plans for PR18*, Cambridge Economic Policy Associates Ltd, April 2018. This may be accessed here.

although the scale of this risk is unquantified. We require Network Rail to ensure that its delivery plan for CP6 is based on a robust and deliverable assessment of direct maintenance activities, resources and costs.

Renewals

2.150. We do not currently have sufficient assurance that the base unit rates are at the level that we would expect Network Rail to be able to achieve now that it has improved its asset management planning. However, from the analysis undertaken we do not yet have sufficient evidence to quantify the impact of this.

2.151. Network Rail has generally used a unit rate ('rate x volume = cost') method when producing its pre-efficient cost base rather than generating more detailed bottom-up cost plans. This is reasonable given the scale and maturity level of the CP6 portfolio. This has been applied to all schemes within the asset workbanks that we have examined.

2.152. Network Rail has tried to normalise its rates to account for inefficiencies as a result of one-off outliers during CP5. But we have concluded that this normalisation process will not have removed all these inefficiencies.

2.153. We have not seen that risk has been included within the pre-efficient rates to a degree that will materially affect the settlement. Where it has been included, we are satisfied that this is to achieve as near as possible to a P_{50} confidence level.

2.154. During the CP6 we require Network Rail to improve its understanding of its Earthworks and Drainage asset information and cost information to support its ongoing planning process.

2.155. During CP6 we expect comparison between routes on efficient delivery to provide sharper incentives to improve, and provide better information for future business planning. We will monitor progress in this area.

Delivery Planning

Assessment criteria

2.156. At this stage in the planning process, forecasting deliverability three, four or five years in the future with high confidence is not considered realistic. While the following questions framed our assessment, we took into account Network Rail's ability to increase certainty over time in forming our conclusions:

- are workbanks deliverable given available access, critical resources (such as engineering plant) and IP/supply chain capacity and capability;

- are volumes appropriately spread over CP6 and take account of transitions from CP5 and to CP7;
- is Network Rail's proposed expenditure profile realistic (based on past performance); and
- are there areas where specific measures are needed to improve confidence in delivery during CP6?

Methodology

2.157. Network Rail completed assurance reviews to determine the deliverability of its maintenance and renewal plans. We have not duplicated these but have assessed the process Network Rail used to complete its assurance and challenged its findings where we identified specific issues.

2.158. We also followed up areas that were identified in the Nichols study of Network Rail's delivery assurance processes undertaken in summer 2017[34] as part of finalising the SoFA.

2.159. Our assessment of Network Rail's SBPs included:

- desktop reviews of key SBP documents regarding delivery;
- challenge meetings with a sample of routes(LNE&EM, LNW, Scotland, South East, Wales); on the outputs of their deliverability assessments, based on the outcome of our risk-based approach to asset management planning
- challenge meetings with the central deliverability assurance team; and
- examination of additional evidence, where appropriate.

2.160. The deliverability of Network Rail's maintenance and renewals activities needs to be assessed in conjunction with both enhancements to Network Rail's infrastructure and other national programmes like HS2, which potentially compete for the same resources. We have considered maintenance and renewals in the context of possible national programmes and, in general terms, consider that the overall volume of work should be within the capability of the wider rail industry to deliver.

2.161. There are inevitable limitations in the analysis we undertook. In particular, while we reviewed historical evidence on volumes and compared this to forecast activity levels, we could not assess the likely future capability of each company in the supply chain.

2.162. There are also risks associated with deliverability. In particular, the overall level of supply chain activity will be affected by future decisions on enhancements. Given that enhancements compete not just with supply chain resources but also with

[34] *ORR PR18 Delivery Planning Review*, Nichols Group Ltd, 31 July 2017. This may be accessed here.

Network Rail's own internal resources and access to the network, we consider it important that the approval process for enhancements takes account of underlying delivery plans for maintenance and renewals and ensures that the cost and other effects of any disruption to these is taken into account.

Findings

Assurance process

2.163. The Nichols review in summer 2017[35] recommended that Network Rail should issue clear and comprehensive guidance for the routes on deliverability and assurance. We found that guidance and supplementary information had been provided to the routes.

2.164. All routes undertook a self-assessment of deliverability, using the framework proposed by Nichols. These self-assessments were included in Network Rail's level 2 assurance report[36] and we found that specific characteristics and risks for each route had been considered.

2.165. From the sample we examined, we found that routes had considered deliverability at several points in preparing their plans. Individual routes concentrated on different factors based on local priorities and stakeholder engagement. For example, Anglia route demonstrated a clear focus on setting out, and gaining in-principle high-level agreement for engineering access plans with operators. On the other hand, South East route focussed on ramping up delivery for the start of CP6 by setting-up a mobilisation team.

2.166. A central Network Rail team, assembled primarily from the IP directorate, provided challenge to each route's self-assessment and also considered network-wide portfolio issues that have an impact on delivery, for example the availability of critical resources, such as specialist engineering vehicles across the network. This assessment considered the following specific areas, which reflected our own views and those from consultation responses on the key issues that should be considered:

- comparison of volume and expenditure profiles against previous delivery;
- assessment of procurement and supply chain strategies;
- national access for engineering works;
- national key resources; and
- national engineering capability.

[35] *ORR PR18 Delivery Planning Review*, Nichols Group Ltd, 31 July 2017. This may be accessed here.
[36] *CP6 Deliverability Assurance Report*, Network Rail, undated.

Access for engineering works

2.167. There is an established industry process for Network Rail to agree access with train operators for planned engineering works. This only looks two years ahead, based on timescales for agreeing timetable changes. Therefore, at this point in the planning process, agreed access arrangements have only been demonstrated for the first nine months of CP6. Some routes have demonstrated effort to gain high-level agreement from train operators for longer term plans, while others have relied on establishing longer term plans through the standard industry processes.

2.168. A comparison of the CP6 profile of renewals expenditure with that for CP5 shows the following routes will require more engineering access than previously taken: Anglia; LNE&EM; Scotland; South East; and Western. Network Rail's assurance did not present any analysis of whether the routes' delivery strategies in CP6 address the risks regarding engineering access.

2.169. Network Rail's central assurance considered major work planned for bank holidays in CP6, when disruptive works are typically undertaken. While the results did not highlight any issues, information was not supplied for Wales, Scotland and LNW.

Key resources

2.170. Network Rail has a well-defined process for booking key resources, which aligns with the process for confirming access. This has provided a system for managing engineering works across the network and ensuring that resources such as signalling testers or cranes are available. In examining Network Rail's track record we found that it has regularly de-conflicted competing demands through prioritisation reviews. However, there have been occasions in CP5 where the provision of scarce resources (such as signal testers) has been tight.

2.171. We found that Network Rail's processes only have a one or two year time horizon. They, therefore, did not provide full assurance for later in CP6, when there are significant increases in resource requirements. This is reflected in the information provided by the routes which generally comprised plans for year one of CP6. However, LNE&EM provided outline plans for the full five years.

2.172. We queried this and Network Rail responded stating that it was looking to expand allocation from two years to the whole control period. This will be critical as Network Rail further develops its assurance as plans develop.

2.173. In terms of high volume output systems used for track renewals across the network, there is a requirement to book locations and times throughout the control period so that the systems can be deployed efficiently and reliably. We found that all the sampled routes had plans for use of high output track systems.

2.174. Network Rail's plans described a peak in signalling volumes in years three and four of CP6. There is currently a similar peak in the last year of CP5, and Network Rail expects to deliver this. This comparison has given assurance that signalling testers required for commissioning would be available in CP6 if resources are maintained at current levels.

Supply chain capacity

2.175. Each RSP included a delivery strategy, reflecting the characteristics, objectives and customer requirements relevant to each route. The primary delivery agents for renewals in each route have been identified as Network Rail's internal functions, Infrastructure Projects for major projects and works delivery for minor works.

2.176. We found that Network Rail's central assurance of procurement and supply chain strategies has been light-touch. It reviewed the delivery strategies for each route; summarised the perceived benefits and risks; and considered progress on sign-off of these strategies. This has not given us the level of assurance, regarding supply chain capacity that we would expect. There was little evidence of outputs from engagement with the supply chain to demonstrate that capacity will be available during CP6. Network Rail stated this will become available as part of the procurement process for major renewals frameworks, which is currently underway.

2.177. However, Network Rail's assurance identified several benefits of the route-based strategies, including: use of local suppliers (supporting the small and medium size enterprise agenda), building closer relationships and better integration between routes and IP. It also concluded that a national procurement plan should be developed to mitigate the risks arising from having eight local procurements plans, such as:

- an increase in procurement activities raising tendering costs for the supply chain; and
- visibility by the supply chain of the whole picture in the absence of an overarching plan.

Enhancements

2.178. The commissioning of enhancements for CP6 is now part of the DfT's pipeline process[37]. One of the key benefits of this approach will be stronger client management to maintain the affordability and deliverability of the enhancements portfolio.

2.179. Network Rail's assessment of its renewals plans, assumed only those enhancements that have proceeded through final investment decision are going

[37]. A new approach for rail network enhancement proposals that require government funding. This may be accessed here

ahead. This means a decision to deliver an enhancement programme once a control period has started or just before it starts will have an impact on the deliverability of the renewals plans of the routes that interface with the enhancement.

2.180. It is therefore important that before decisions are taken on new enhancement programmes, the impact on a route's maintenance and renewal plans is considered.

2.181. In England & Wales, we found that the process for considering deliverability of enhancement and impacts on maintenance and renewals is still under development. We require Network Rail to finalise this process as part of its planning for CP6 and we will review progress towards this.

2.182. In Scotland, Network Rail stated that opportunities to align renewals and enhancements are considered in current industry planning groups. However, no evidence was provided that deliverability of the maintenance and renewals portfolio was considered in the decision making process. Network Rail will have to focus on assuring its core maintenance and renewal portfolio and that any impact from enhancements should be identified and agreed as part of the enhancement approval process.

Route specific findings[38]

Route	Finding
Anglia	1. Access: Anglia's long term access planning has developed a detailed week-by-week plan by section of line for the whole of CP6. This has stakeholder buy-in from key passenger operators. 2. Critical resources: Detailed week-by-week plan has also enabled the route to identify resources. However, no resource demand profiles have been incorporated into the national consolidated plan past year three of CP6. 3. Delivery strategy and procurement: Planned to contract 50% of IP work activity before CP6 begins to give certainty to IP suppliers. Full review of Works Delivery has been started to make sure the organisation is optimised for delivery of small to medium projects. The route have assumed that

[38] These are selected key points from our detailed reviews.

Route	Finding
	completion of the Elizabeth Line and Thameslink in CP5 will increase supply chain capacity. 4. Maintenance: Network Rail's self-assurance using the ABP tool has concluded an average delivery confidence of 64% for the route.
LNE&EM	1. Access: The route has planned engagement with train operators on a longer term strategy. Information on work at bank holidays has been provided to the central assurance team. 2. Critical resources: Critical types of resources have been identified in the route's deliverability assessment. High level resource demands have been provided for the whole control period, giving confidence the route has made good progress in understanding the resource requirements for the route. 3. Delivery strategy and procurement: The plan is based on continuing the current framework contracts into early CP6. Seeking to transition to a "closer and fewer" model. This is planned to drive efficiencies through better understanding of CP6. This understanding should also help the supply chain to mobilise the required capacity. 4. Maintenance: Network Rail's self-assurance using the ABP tool has concluded an average delivery confidence of 61% for the route.
London North West	1. Access: The route has plans to develop more stringent governance arrangements in CP6. 2019 access plans are currently progressing through standard industry processes. Plans for 2020 and 2021 are currently being prepared for initial industry discussion. Major and bank holiday information has been provided for LNW, however there are some aspects of access that are yet to be defined.

Route	Finding
	2. Critical resources: LNW deliverability report has identified different types of critical resource and highlights some potential issues due to work clashes (signalling testers), HS2 using resources (OLE linesmen) and shortage of structures examiners. 3. Delivery strategy and procurement: It is planned to extend selected current framework by a minimum of two years into CP6 to avoid transition issues. There is a risk to signalling delivery as the procurement strategy is still to be approved. 4. Maintenance Network Rail's self-assurance using the ABP tool has concluded an average delivery confidence of 41% for the route.
Scotland	1. Access: Access in Scotland has historically been planned on a cyclical pattern that is familiar to operators. The route does not expect to vary from this pattern. 2. Critical resources: No significant specialist resources issues were identified. The move to more signalling refurbishment compared to full renewals was expected to reduce this risk. Main risk identified for deliverability of renewals is the interface with the uncertainty of enhancements. 3. Delivery strategy and procurement: A move from full signalling renewals to refurbishment was expected to de-risk supply chain capacity by increasing the number of suppliers in the market. 4. Maintenance: Network Rail's self-assurance using the ABP tool has concluded an average delivery confidence of 48% for the route.

Route	Finding
South East	1. Access: Progressing via the standard industry processes for year one of CP6. The route has identified key bank holiday works and has shared them with train operators to gain buy-in at an early stage. There are also several initiatives ongoing, in consultation with train operators, to improve productivity in possessions. 2. Critical resources: Key resources have been provided to the national consolidated plan for year one and part of year two. The route has been in consultation with IP signalling to further develop its plans, which has increased confidence they are deliverable. Engineering resources have also been reviewed for the key bank holiday works. 3. Delivery strategy and procurement: There is clarity on the delivery strategies for CP6 which have now been signed-off. Works delivery strategy for CP6 frameworks is in place and restructuring of the team for optimum delivery in-place. IP Southern has gone through several supplier engagement events to share high level plans and gain views from supply chain which the route has used to further refine its plans. 4. Maintenance: Network Rail's self-assurance using the ABP tool has concluded an average delivery confidence of 55% for the route.
Wales	1. Access: The Wales franchise is in the process of being re-tendered, which will see a new train operating company. Network Rail has followed the standard access planning process for year one, by consulting with the current train operator (Arriva Trains Wales) but has been unable to agree future years. The route has plans to improving productivity through new technology, such as Geographical Information Systems (GIS) tools.

Route	Finding
	2. Critical resources: The route has high confidence in the availability of resources as it primarily has resources based in Wales and it does not compete with other rail projects, such as HS2. Its plans have identified the main issues, such as maintaining a base of skilled locking fitters to maintain older signalling technology over a longer period. 3. Delivery strategy and procurement: There has been consultation with delivery partners (IP and WD) to ascertain the optimum delivery strategy. The local IP team has also consulted with the supply chain via the Civil Engineering Contractors Association (CECA). 4. Maintenance: Network Rail's self-assurance using the ABP tool has concluded an average delivery confidence of 60%. 5. Other: The Wales franchise tender provided bidders with flexibility to propose innovative ways of delivering improvements and projects on the Metro service. This could impact on Network Rail's maintenance and renewals plans for this section of line and is considered both a risk and opportunity, due to the uncertainty about the outcome.
Wessex	1. Access: The route has assumed volumes (e.g. c20km track renewals per year) will continue based on current access arrangements, where a cyclic access regime has been established. However, at the time of the assessment there was an imminent franchise change. Due to the timing of the franchise award, longer term engagement on access was not feasible. Despite this, the route provided major and bank holiday works to the central assurance team for CP6, based on its existing arrangements. 2. Critical resources: Wessex resources information provided to the central assurance team only covers the first year of CP6, with the second year at a

Route	Finding
	high-level. However, Route Services had confirmed that there was sufficient critical resources capacity to support the delivery plan. 3. Delivery strategy and procurement: The Level two assurance team's engagement with the route has confirmed that delivery strategies are in place. 4. Maintenance: Network Rail's self-assurance using the ABP tool has concluded an average delivery confidence of 52%.
Western	1. Access: Western had identified risks to gaining access arising from new services, such as those running on the Elizabeth Line, and ongoing significant enhancement works into CP6. To mitigate these it has looked at improved work packaging and leveraging benefits from the alliance with Great Western Railway. It provided information on major and bank holiday works to the central assurance team, giving confidence it was clear on its requirements for these key periods. 2. Critical resources: Central assurance has indicated that the high-level forecasts provided by the route do not make clear the demand for key resources. 3. Delivery strategy and procurement: Central assurance identified a lack of clarity about agreement with delivery agents. A plan has been put in place to identify work on an annual basis with the supply chain until a longer term strategy is in place. 4. Maintenance: Network Rail's self-assurance using the ABP tool has concluded an average delivery confidence of 52%.

Balanced spread of work

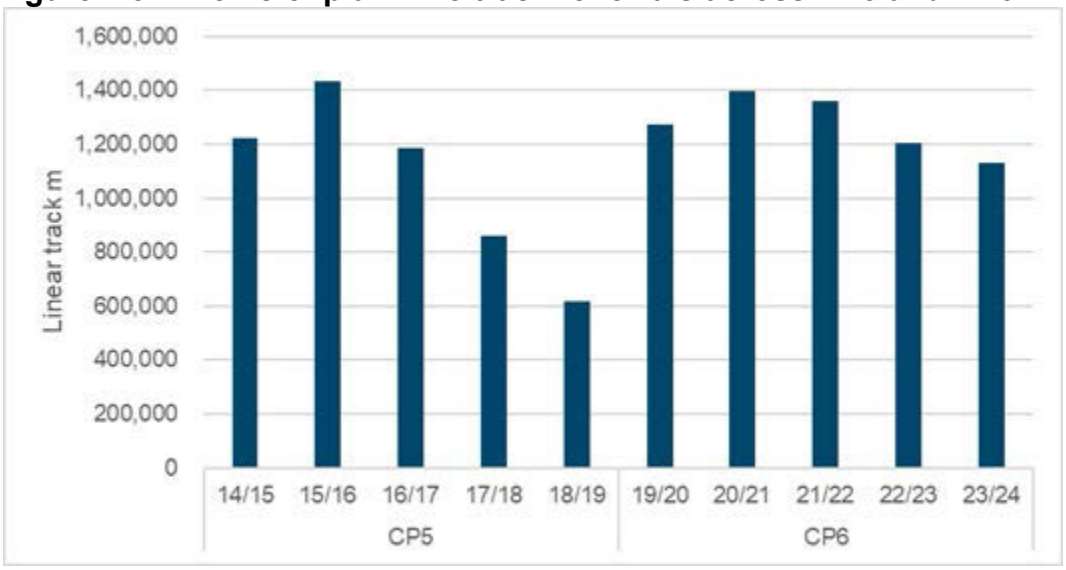
2.183. The units used to measure delivery of renewals by Network Rail vary across and within asset groups and cannot be aggregated. For example, plain line track kilometres cannot be added to signalling equivalent units (SEUs), to provide an aggregated view of total volume. Due to the number of different volume measures, Network Rail has selected seven key volumes:

- track (plain line) measured by linear track kilometres;
- track (switches and crossings) measured by the number renewed;
- signalling measured by SEUs;
- embankments, soil cuttings and rock cuttings measured by the number of five-chain lengths;
- underbridges measured by m^2 plan deck area worked on;
- electrification (wire runs) measured by the number of replacements of OLE assets from anchor to anchor (on average 1.6km in length); and
- electrification (conductor rail renewal) measured by kilometres of work done.

Track (plain line)

2.184. Figure 2.3 sets out the profile of plain line renewals in Network Rail's plans.

Figure 2.3 - Profile of plain-line track renewals across CP5 and CP6



Source: Network Rail

2.185. Annual delivery set out in the RSPs was within that already achieved in 2015-16. However, Network Rail has reported a significant ramp-up from the end of CP5 to the start of CP6. Network Rail has considered the risk that the supply chain might not be able to service this increase, especially if it had downsized towards the end of the current control period. As a result, Network Rail has been able to bring work

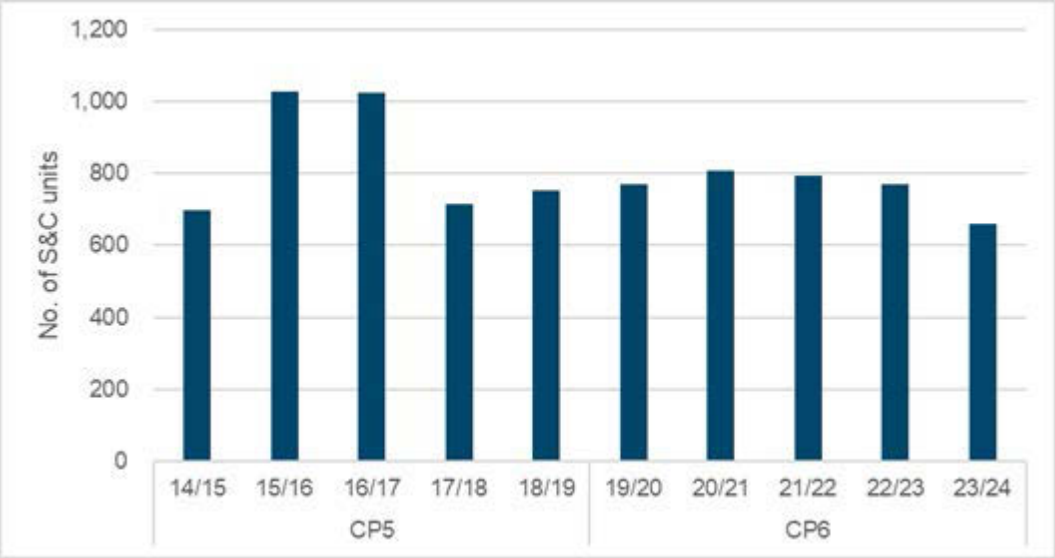
forward to the final year of CP5 for LNW, LNE&EM and Wessex. This is intended to maintain the supply base.

2.186. Network Rail's has commenced a new procurement strategy, with improved commercial terms, benchmarking and performance, based on a proven alliancing approach used for switches and crossings in CP5.

Track (switches and crossings)

2.187. Figure 2.4 sets out the profile of switches and crossing renewals in Network Rail's plans.

Figure 2.4 - Profile of switch and crossing track renewals across CP5 and CP6



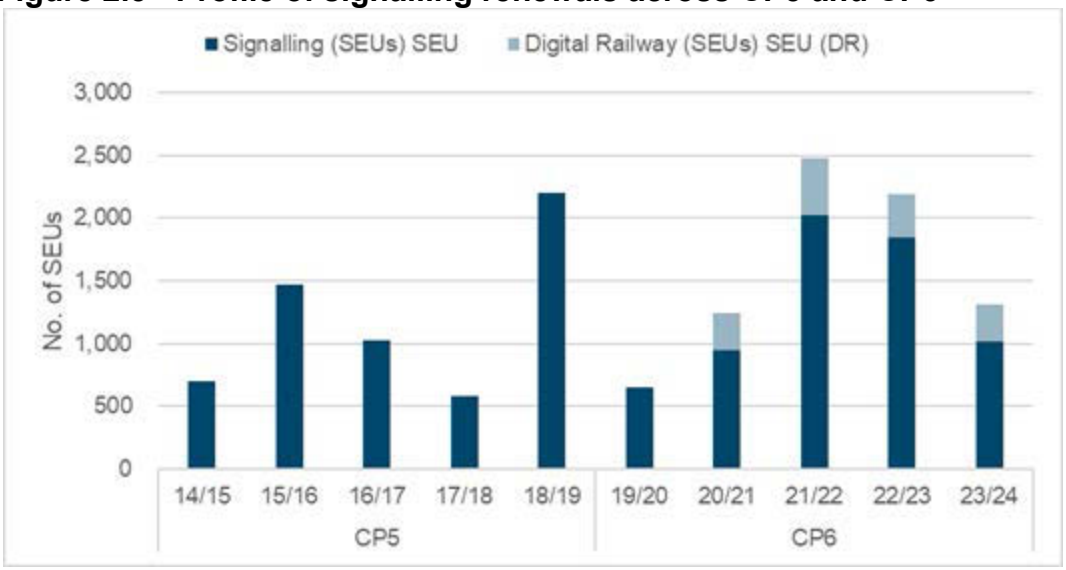
Source: Network Rail

2.188. Network Rail's annual delivery profile has been planned within that achieved already in CP5. Its track record with the supply chain has been good and has provided a contracting model for other categories.

Signalling

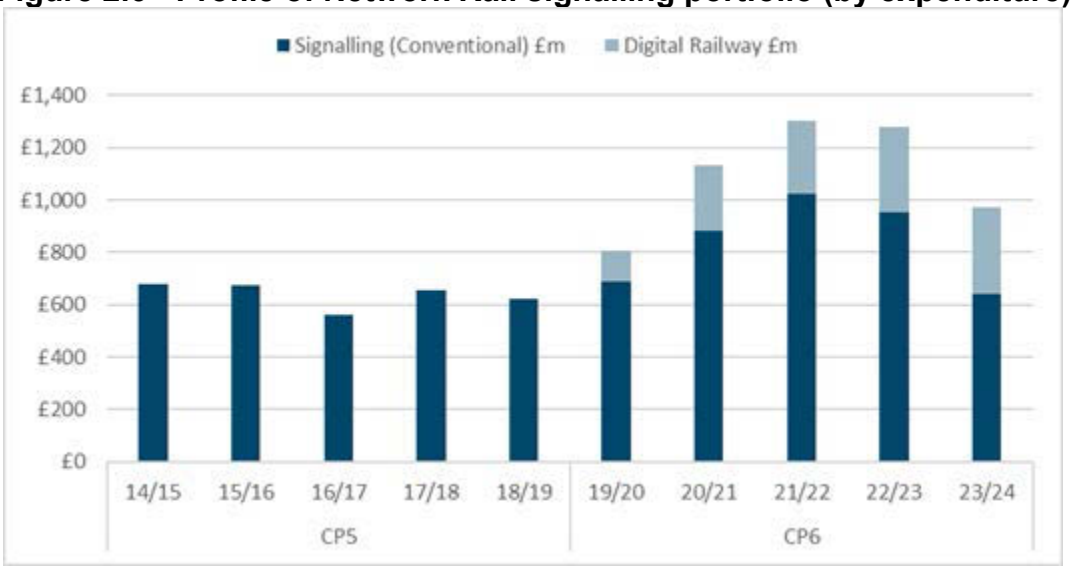
2.189. Figure 2.5 sets out the profile of signalling renewals in Network Rail's plans and Figure 2.6 sets out the expenditure profile. (Refer to chapter 6 for further information about digital railway items).

Figure 2.5 - Profile of signalling renewals across CP5 and CP6



Source: Network Rail

Figure 2.6 - Profile of Network Rail signalling portfolio (by expenditure)



Source: Network Rail

2.190. The total volume of signalling renewals planned for CP6 has increased by 32% when compared to CP5. This is a larger increase than for any of the other key volumes. However, excluding digital railway programme work[39] then the total increase in renewals volumes planned is 8%.

2.191. The mix of signalling renewals presented in Network Rail's plans is different in CP6, with routes generally proposing refurbishment rather than full renewals. While the signalling profile presented is uneven, the major re-signalling projects included in the plan will typically take a number of years to complete but are only recorded at final commissioning, meaning that while years three and four show an increase in

[39] The Digital Railway programme work referred to in this section is limited to the items described in Table 6.1. The impact of additional enhancement schemes on the base workload will need to be considered as part of the associated authorisation and change control processes.

volumes much of the work will have been undertaken in previous years. Therefore, the expenditure profile in shown Figure 2.6 should be considered alongside the volumes profile in Figure 2.5 as the former shows that Network Rail has planned a smoother step up in expenditure.

2.192. Network Rail's central assurance highlighted signalling volumes in years three and four as a significant risk. To mitigate this, we found evidence that Network Rail has undertaken some smoothing of the profile since earlier iterations. However, as Network Rail's detailed booking and assurance processes for engineering access and critical resources only have a one to two year look ahead we have not been fully assured that this peak in volume can be delivered.

2.193. Network Rail has also planned a peak in SEU delivery in the final year of CP5. This requires more SEUs to be commissioned this year (2018-19) than planned in year three of CP6, (excluding digital railway programme work). The availability of critical signalling resources, especially testers, is a key factor in the deliverability of signalling projects. As described above, the resource planning process does not extend to the peak in delivery in year three of CP6 but it does cover the peak in year five of CP5. Network Rail has demonstrated that there will be adequate signalling tester resources for the delivery of Network Rail's 2018-19 plans. Through our regular monitoring we have also found that Network Rail is currently expecting to deliver to its plan for 2018-19.

2.194. We found that Network Rail has introduced new ways to manage the risks around testing resources, including enhanced training (rehearsals) and staggering the testing and commissioning of work sections in a progressive way. This means that not all elements will need to be tested together within a single possession.

2.195. Network Rail has developed a national procurement strategy, in consultation with routes and suppliers and we saw evidence that this reflects the signalling requirements of each of the routes, while providing flexibility so that emerging enhancement works could be accommodated.

2.196. However, we found little evidence of assurance that the supply chain has the capacity to deliver. Similar concerns were identified in the review of Network Rail's approach to financial risk assessment and management for PR18, undertaken by CEPA[40].

2.197. The expenditure profile also shows a peak in activity in year three and year four of the Control Period. Network Rail's Level two assurance report highlighted this as one of the key deliverability risks where urgent action is required. A follow-up review

[40] *Review of Network Rail's approach to Financial Risk Assessment and Management in its Strategic Business Plans for PR18*, Cambridge Economic Policy Associates Ltd, April 2018. This may be accessed here.

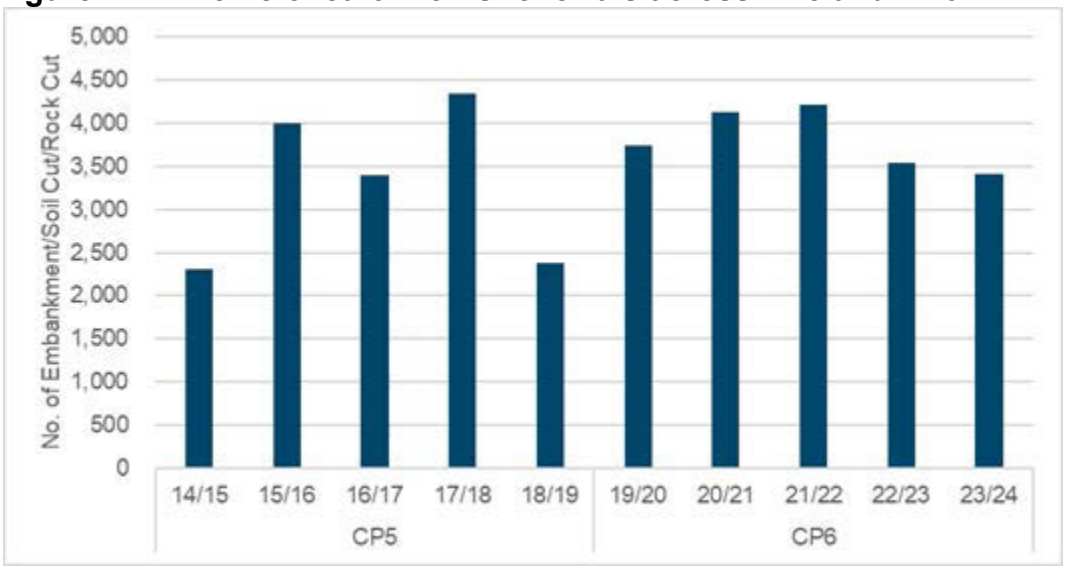
is currently being completed by Network Rail into this issue. However, a change in the profile will not be proposed until the next iteration of the plan in November 2018. This will be after our final determination, and Network Rail's ability to re-profile its workbank at this time will be limited by the public sector funding flexibility constraints.

2.198. Network Rail has also provided its enhancements forecast and incurred expenditure by asset group when requested, but it does not usually report cost information for enhancements disaggregated by asset group. This still shows an increase in signalling expenditure in the middle of CP6, as shown previously in Figure 2.5. It should be noted that this only includes enhancement projects that are due to complete Final Investment Decision (FID) within CP5 and Network Rail does not have HS2 and Transport for London (TfL) data disaggregated by asset group. It is therefore important that Network Rail continues to review the future requirements for signalling resources to review if the supply chain can meet the demand.

Earthworks

2.199. Figure 2.7 sets out the profile of earthworks renewals in Network Rail's plans.

Figure 2.7 - Profile of earthworks renewals across CP5 and CP6



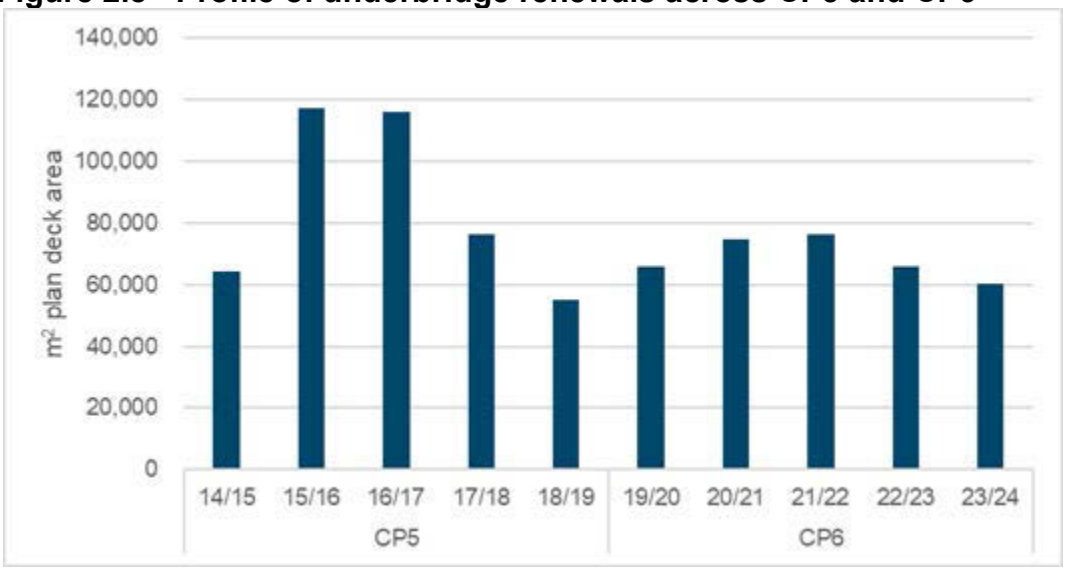
Source: Network Rail

2.200. There is a 16% increase in the total volume of works to be completed in tCP6 over CP5. In general, the routes' assurance reviews highlighted that most works in year one and year two of CP6 are well developed but more development of workbanks for later years is required. From our regular monitoring we found that this was in line with the nature of this type of activity. We also found that Network Rail delivered about 4,000 five-chain lengths in 2017-18.

Structures - underbridges

2.201. Figure 2.8 sets out the profile of underbridge renewals in Network Rail's plans.

Figure 2.8 - Profile of underbridge renewals across CP5 and CP6



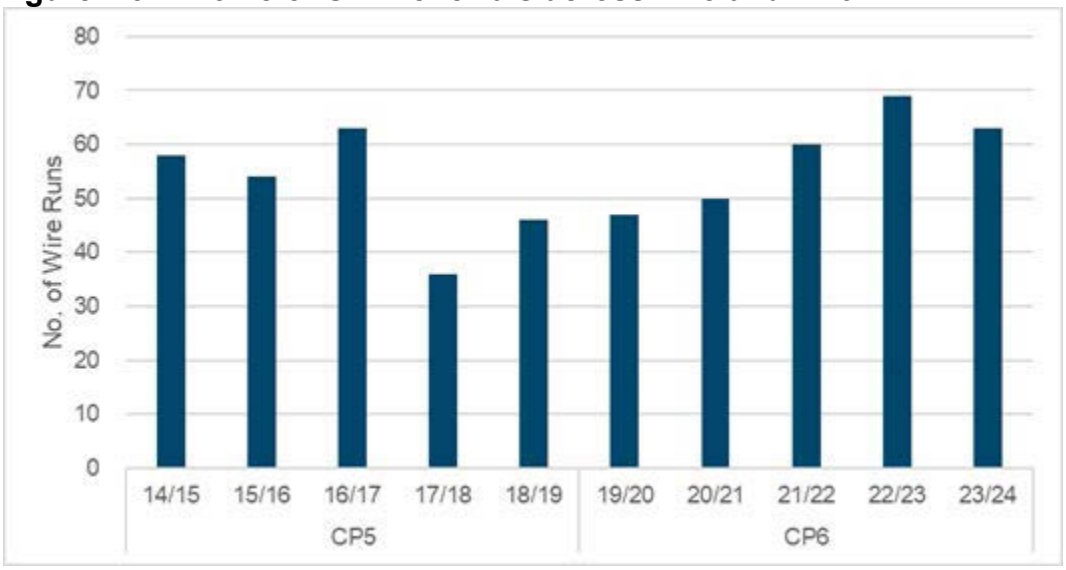
Source: Network Rail

2.202. Network Rail's planned work showed a 20% reduction in the total volume of underbridge works in CP6, compared to CP5. The profile presented was relatively smooth throughout CP6 without a major ramp-up at the start.

Electrification – OLE wire runs

2.203. Figure 2.9 sets out the profile of OLE wire run renewals in Network Rail's plans.

Figure 2.9 - Profile of OLE renewals across CP5 and CP6



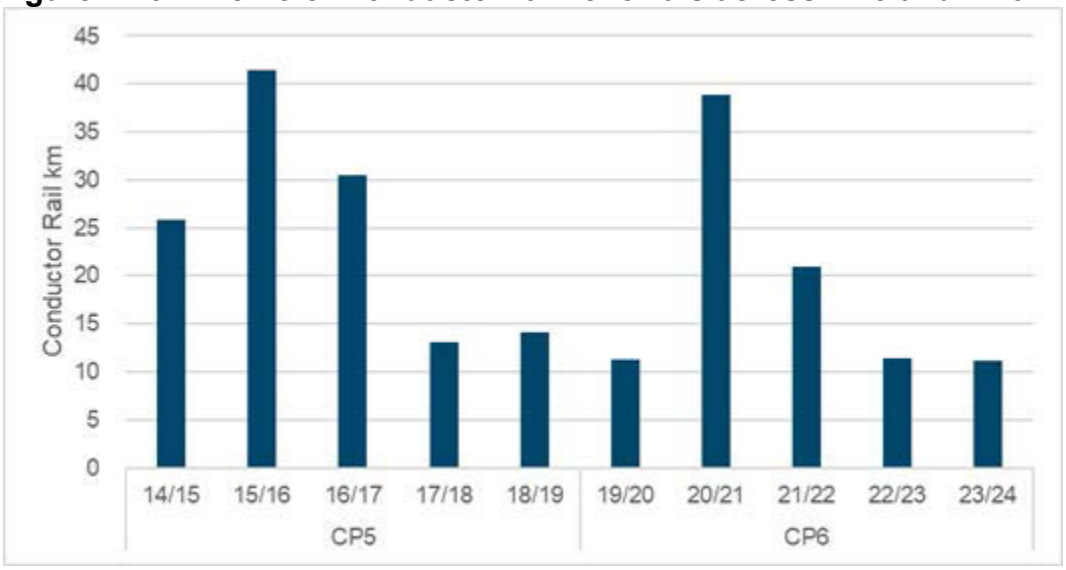
Source: Network Rail

2.204. Network Rail's planned work showed a total increase in volume of 12%. The maximum annual volume planned (in 2022-23) would be ten percent% higher than the maximum achieved in CP5 (2016-17). The profile has avoided significant peaks. The central assurance report highlighted uncertainty regarding the delivery agents for refurbishment works. This lack of clarity and the unknown impact on resources could impact on deliverability of the volumes unless procurement strategies are developed soon.

Electrification – conductor rail

2.205. Figure 2.10 sets out the profile of conductor rail renewals in Network Rail's plans.

Figure 2.10 - Profile of Conductor rail renewals across CP5 and CP6



Source: Network Rail

2.206. Planned conductor rail renewal volumes showed generally less than in CP5, with the exception of a peak in year 2 (2020-21). Network Rail has stated that it intends to revisit this as part of its rolling planning process. We found no technical constraints to smoothing this profile.

Route specific findings[41]

Route	Finding
Anglia	Signalling (excluding Digital Railway programme) and OLE wire runs had significant increases, 315% and 232% respectively. However, for signalling, schemes had mostly been developed during CP5. There is a significant planned increase at the start of CP6 for track plain line. There was clear definition of workbank, access and resources for this year.

[41] These are selected key points from our detailed reviews.

Route	Finding
	There was a significant amount of traffic management work expected in year two of CP6 that is expected to be funded separately. If this project goes ahead, the impact on the core renewals plan will need to be understood as part of the decision making process.
LNE&EM	The planned profile for plain line track renewals is smooth throughout CP6 and within annual delivery levels achieved for some years in CP5. This was one of the main route plans driving a peak in signalling work in year three of CP6. S&C, earthworks, underbridges and wire runs all had reduced planned renewal volumes for CP6 compared to CP5. The Kings Cross remodelling project added significant planned volume in the first year of CP6.
LNW	The plain line track renewals profile was smooth throughout CP6 and within annual delivery levels having been achieved in some years of CP5. However, a significant increase will be required for year one of CP6. LNW is one of the three routes where increased funding has been agreed for the end of CP5, to support the supply chain in preparing for this increase. While there was slight reduction in the total volume of signalling work planned in CP6 compared to CP5, LNW is another route which drives the peak in delivery in CP6. There was a 48% increase in earthwork volumes planned for CP6, with a ramp-up in delivery required in the first few years of the Control Period. The route was confident the workbank had been well developed for these early years. There were increases in electrification asset renewals that will need to be managed as plans are developed.
Scotland	Planned renewals for all key asset categories in CP6 were no more than 8% greater than those delivered in CP5. Scotland's delivery of renewals in CP5 has been good, so there are indications that CP6 volumes can be expected to be deliverable. The central assurance report noted that uncertainty around enhancement funding was a key risk to signalling renewals, as this workbank will be linked to the assumed enhancements portfolio.
South East	Planned plain line track renewal volume had increased by over 30% compared to CP5. There was a significant increase in work for year one of CP6. The route's assurance of deliverability for year one appeared to be robust and a mobilisation team had been put in place.

Route	Finding
	There was a peak in signalling delivery in year three. The route had gained assurance from IP signalling that the plan will be deliverable. There was a significant planned increase in earthworks for CP6.
Wales	All CP6 key volumes appeared to be set at deliverable levels when compared to those achieved in CP5.
Wessex	A large ramp-up in plain line track renewals will be required for year one of CP6. This is one of three routes where work has been brought forward to the end of CP5, to support the supply chain in preparing for this increase. There was a significant increase in signalling volumes in CP6, with a peak in delivery in year four of the control period. A steady increasing trend of earthworks volume was planned to be continued in CP6. The planned profile of conductor rail renewals was flat across the control period.
Western	There was a noticeable increase in planned underbridge renewal volumes in CP6 (increase of 59%). All other volumes were in the same order as CP5.

Updates to delivery planning

2.207. We have noted that the delivery planning process is iterative with greater detail and certainty emerging as work banks are finalised, designs developed and access and other logistical matters are confirmed. Since publication of the SBPs in February 2018 Network Rail has continued to work on its plans and further details will emerge from its ongoing business planning update and from its CP6 delivery plan. We will monitor these and expect to see progress on all of the areas which we have identified above.

2.208. Some limited developments were reported by Network Rail in its response to our draft determination. In particular:

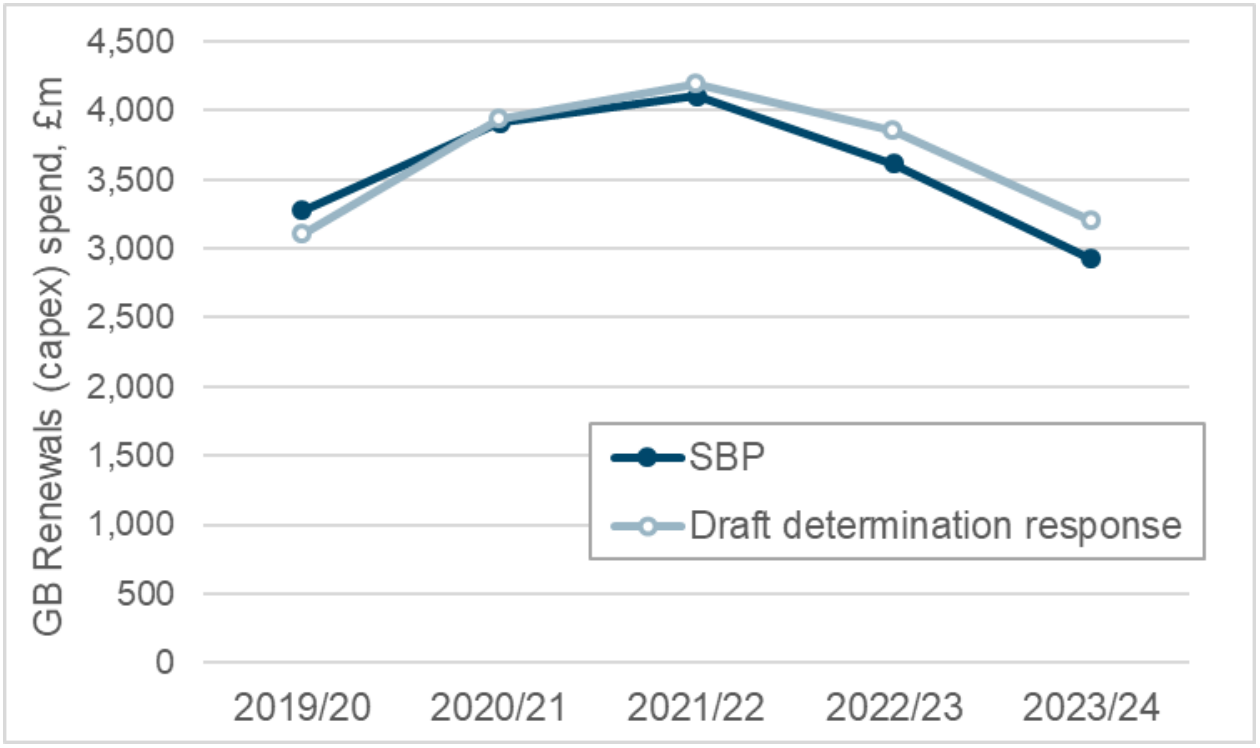
- inclusion of £608m of additional renewals to improve asset sustainability; and
- changes to expenditure profiles – these were generally relatively small in the overall context of the company's programme and involved moving work to the later years of CP6.

2.209. We have considered the delivery implications of the extra asset sustainability work proposed by Network Rail (including reviewing Network Rail's own assurance of the programme). In our view, the scale and nature of the additional work does not significantly affect deliverability of the overall maintenance and renewals

programme provided that details of the work (including any additional renewals which could be supported by 'contingent asset management funding') are finalised sufficiently in advance to support the progressive development of detailed plans. It is important that these plans are supported by a rigorous assurance process and we will continue to monitor Network Rail in this area.

2.210. The proposed changes to the expenditure profile serve to better smooth workloads across the control period (see Figure 2.11) but there is not yet a smooth transition into CP7. However, we note that if risks do not materialise and so 'contingent asset management funding' becomes available, this is likely to increase work volumes in the later years of CP6. We will continue to monitor this and encourage Network Rail to seek further improvements to the continuity of work for its supply chain. Although they fall outside the scope of this periodic review, the timing of enhancement programmes and other rail projects will also have a role to play in this matter.

Figure 2.11 – Effect of re-profiling and additional renewals in CP6



Conclusions

2.211. We have agreed with Network Rail's conclusions that action is required to manage the volume related risk to signalling delivery in year three and year four of CP6. Network Rail has commenced a further review of signalling delivery to inform any re-profiling of its expenditure forecast. This is expected to be completed after our final determination and so consequential changes to the planned expenditure profile will have to be managed by Network Rail within governmental financial rules.

2.212. The outcome of this review together with the effect of other re-profiling and additional asset sustainability related works is expected to smooth the profile of work set out in the SBPs – particularly in the later years of CP6. Any deployment of contingent asset management funding into renewals will also serve to improve the continuity of work for the supply chain across the CP6 – CP7 boundary and this is likely to improve overall efficiency. We expect Network Rail to do more (including coordinating maintenance and renewals programmes with enhancements and other rail projects) to further improve this.

2.213. Network Rail's processes to consider the availability of access and critical resources only have short planning horizons and do not extend across the whole of CP6. We therefore require it to undertake a further validation that critical resources will be available to support the planned volumes of work. This should encompass detailed planning of the additional asset sustainability related works (including those which may be supported by 'contingent asset management funding') and should be embedded in the company's rolling business planning process as a five-year forward look.

2.214. The delivery planning process and associated uncertainty is made more complicated by the exclusion of enhancement schemes. The new process for review and approval of enhancements will improve the certainty of delivery for projects but it is important that this is not to the detriment of the base maintenance and renewals programme. Similarly, potential synergies between renewals and enhancements in the pipeline also need to be identified by Network Rail for efficient delivery and maximum value. We will monitor the effectiveness of this process.

2.215. Network Rail's plans for CP6 require a significant increase in expenditure in year one compared to year five of CP5 and experience from CP5 shows that delays at the beginning of the programme can cause significant disruption later. With only five months until the start of CP6, it is important that Network Rail and each of its routes are in a position to make a good start to the control period, and avoid the mistakes of the past. With this in mind, we have reviewed the preparations for the start of the control period, and have included key preparedness metrics in our recent Network Rail monitor. We will continue to monitor this preparedness ahead of 1 April 2019, including by updating this analysis in our forthcoming monitor.

Significant changes since draft determination

No.	Subject	Affected paragraphs
1	Confirmation that Network Rail's updated proposal will address concerns raised by STE about specific areas of unmitigated shortfalls in renewal levels.	2.31 - 2.34
2	General updates to route specific comments to align with revised proposal.	2.35
3	SAF and CRI targets in specified routes to be monitored.	2.50 - 2.51 2.54 - 2.55
4	Consideration of Network Rail's proposals in respect of improving asset sustainability.	2.66 - 2.76
5	Role of additional renewals which may be supported by 'contingent asset management funding'.	2.77 - 2.84
6	Incremental benefits from the renewals programme	2.85 - 2.87
7	Asset management conclusions updated to reflect items 1-6.	2.94 - 2.98
8	Delivery planning update included and conclusions amended to reflect additional asset sustainability related renewals, changes to expenditure profiles and general progress in CP6 planning	2.207 - 2.210, 2.212 - 2.215

3. Research and development costs

Assessment criteria

3.1. The following questions framed the assessment of this area:

- what budget should be provided for R&D work?
- recognising the wider benefits of R&D, is matched funding available to support Network Rail's R&D programme?
- does Network Rail have an appropriate governance framework?
- Is the scope of R&D activity appropriately targeted to support delivery of CP6 and future objectives?

Findings

3.2. In the draft determination we noted the potential benefits of a R&D programme but expressed concerns over the apparently large increase in planned expenditure in CP6 compared with CP5, the weak evidence presented for the level of proposed spend, and with Network Rail's proposed governance arrangements. We considered that in these circumstances, switching expenditure to improve asset sustainability would represent better value for money.

3.3. We therefore proposed that Network Rail's budget for R&D should be reduced from £440m to £100m, to bring it into line with the level of spend in CP5, as indicated by Network Rail's submissions to ORR. We also considered that improvements to governance arrangements should be made before R&D expenditure is committed.

3.4. In recognition of the benefits that R&D can bring, we considered that the level of expenditure could be increased if further funding became available during CP6.

Network Rail's response to the draft determination

Structure of response

3.5. Network Rail responded to the draft determination with a detailed submission. This included

- a re-statement of the actual level of expenditure in CP5 as being £238m when R&D work undertaken through other projects and programmes is aggregated (rather than the circa £100m figure included in its original submission);
- new evidence that included details of planned R&D projects, with estimated costs and an assessment of their potential benefits;
- an explanation of how R&D expenditure contributes to improvements in asset sustainability;

- details of governance and how the deliverability of R&D projects will be reviewed; and
- proposals for securing matched funding to support the R&D programme.

R&D budget

3.6. Network Rail's response to the draft determination proposed a budget for R&D activity in CP6 of £245m. This was presented in the context that comparable expenditure in CP5 totalled £238m.

3.7. CP5 expenditure was incurred across a range of projects and initiatives rather than through a centrally coordinated programme. Activities are summarised in Table 3.1

Table 3.1 – Network Rail expenditure on R&D in CP5

Business area	Spend	Example projects
STE R&D Team	£38m	DIFCAM, Shift2Rail, COMPASS
Digital Railway programme	£58m	Test train development, ETCS Melton trials
ORBIS Programme	£30m	Development related to DSTs, LADS and Data Collection Services Enhancement
Maintenance Effectiveness Programme	£32m	Eddy Current, PLPR, Intelligent Infrastructure
Infrastructure Projects	£20m	Track Den initiatives, IP Signalling data collection, RILA
SCADA	£30m	Software Development
Electrical Safety Design	£20m	Hardware development, Bus bar development
Other parts of the business (Routes, Air ops and Route services System operator)	£10m	Rail Milling, Whole system modelling, Drones, University research done at route level
Total	**£238m**	
Source: Network Rail, 2017-18 prices		

Matched funding

3.8. Network Rail plans to supplement its R&D funding with additional matched funding from third parties. In sizing its R&D programme, it has assumed that £112m of such funding can be secured.

Governance

3.9. Network Rail has proposed a governance process which is based on:

- application of Network Rail investment regulations to R&D projects via an investment panel;

- investment decisions being informed by DRSAMs, a Technical Leadership Group drawing on Rail Delivery Group and Rail Supply Group members and an advisory board with representatives from DfT, Transport Scotland and industry R&D experts; and
- accountability for successful delivery of the R&D programme vesting in the Group STE Director.

Scope of R&D activity

3.10. Network Rail have set out a list of 129 R&D projects which it has identified and prioritised within an assumed budget of £357m (£245m core funding plus £112m matched funding). These items have been prioritised from proposals put forward by cross industry stakeholders and Network Rail's own engineering teams. The projects cover the fields shown in Table 3.2.

Table 3.2 - Areas of Network Rail R&D Expenditure

Programme / Project	Total CP6 Budget (£m)
Data and Information	10
Future communications and train control	83
Efficient Asset Management	193
Home Safe Plan	36
National Security Programme	20
Shift2Rail	15
Grand Total	**357**
Source: Network Rail, 2017-18 prices	

Transport Scotland's response to the draft determination

3.11. Transport Scotland supports R&D however it was clear in its response to the draft determination that there must be a clear line of sight between proposals for research and development and Scottish Government strategic priorities, including outcomes for Scottish rail passengers and freight customers. Transport Scotland also wants visibility of how R&D spend can benefit the Scottish economy (i.e. research by Scottish universities).

Our assessment of Network Rail's and Transport Scotland's responses

R&D budget

3.12. We accept Network Rail's submission and welcome the inclusion of all future R&D activity under a single programme. We consider that this should provide greater transparency and accountability for R&D expenditure. We also accept the higher historical baseline as a factor when considering the deliverability of the programme and the importance of continuity in activity levels.

3.13. Network Rail has proposed an R&D budget of £245m supported from ring-fenced SoFA funds. This is supported by a series of outline business cases which indicates a potential average benefit: cost ratio (BCR) of 2.8.

3.14. The nature of R&D activity means these returns are not certain and many are likely to accrue in future control periods. However, we have reviewed the methodology used by Network Rail to estimate likely benefits (which takes account of the different likely success rates of projects at different levels of maturity) and found it to be reasonable. When taken alongside the proposals for governance across the portfolio, we accept that the updated proposals for the R&D programme should provide long-term benefits. Network Rail's management processes include steps to define and track potential benefits and we think it is important that the governance process should regularly review and challenge these assessments.

3.15. Finally, we have considered the proposals on R&D spend alongside the proposals for efficiency improvements and asset sustainability. In light of our decisions in these areas, we consider that an increase in R&D spend relative to our draft determination is justified.

3.16. We therefore conclude that Network Rail's proposed budget of £245m is reasonable and should be funded within the final determination. We will monitor performance against the expected benefit: cost ratio of 2.6.

Matched funding

3.17. We note that no firm commitments to provide matched funding have yet been secured (which is not unusual, given that Network Rail's spend is still to be finalised) but that Network Rail is confident that this finding can be secured based on having secured £68m of similar funding in CP5.

3.18. The implementation programme presented by Network Rail assumes that the matched funding will be available. We have some concerns over the scale of funding to be secured and we therefore consider that Network Rail has more to do to ensure that this external funding will be available in the timescales envisaged. We expect Network Rail should therefore plan its R&D programme so as to avoid any disruption if matched funding is delayed or unavailable.

3.19. This does not mean that we think that a significant degree of matched funding is optional. It is a very important aspect of improving efficiency across the wider rail industry and is likely to have benefits beyond those which accrue to Network Rail and its direct customers. We therefore expect Network Rail to strengthen its efforts to secure matched funding and to report on its progress ahead of and during CP6.

3.20. We are pleased that Network Rail understands the importance of securing the benefits of R&D carried out with third parties and we expect it to continue to protect

its interest in intellectual property rights and associated licensing arrangements arising from R&D.

Governance

3.21. It is important that R&D activities support the whole range of Network Rail's operations, maintenance, renewals and support activities and a duty to consider this should be embedded in the remit of the R&D board. The board should also include representatives of Freight and National Passenger Operators route and the SO as well as engineering specialists.

3.22. The advisory board will include a representative from Transport Scotland and we consider that this will provide a suitable way to meet its concerns about the alignment of R&D with the priorities of Scottish Ministers as well as the needs of Network Rail Scotland route. (This is discussed in more detail in our Scotland summary document[42]).

3.23. We think that it would be beneficial for the board to review the proposed list of R&D projects before the CP6 programme commences. This would also provide an opportunity to consider any R&D requirements which may arise from our ongoing timetabling review.

3.24. Network Rail also described use of the Rail Industry Readiness Level framework to provide an objective assessment of the status of R&D projects and the role of a Project Development Framework (PDF) panel of experts from routes and central functions to validate these assessments. Network Rail states that this assessment is a pre-condition to the funding of R&D projects.

3.25. We consider that Network Rail has proposed a governance process which is appropriate to the planned R&D programme. We expect to see the governance arrangements formalised and fully implemented before any CP6 R&D funding is committed.

3.26. We note that the pipeline of projects will be dynamic and is expected to change as schemes either succeed and pass into implementation or are terminated if they do not fulfil expectations. We also note that changes in the availability of both ring-fenced and matched funding may change the programme and that emerging issues could affect priorities. The detailed governance process should address all of these matters.

[42] *PR18 final determination - Summary of conclusions and route settlement– Scotland*, ORR October 2018. This may be accessed here.

Scope of R&D activity

3.27. We anticipate that the list and mix of R&D projects will vary over time from that included in Network Rail's proposal. The use of a portfolio approach can be expected to spread risk and allow Network Rail to identify and progress projects which offer strong benefits.

3.28. The largest part of the programme relates to efficient asset management and this contributes to asset sustainability and future efficiencies. We think that it is reasonable that this is the major focus of R&D activities under the SoFAs and we expect this to deliver future asset sustainability and other benefits across the whole network.

3.29. We note that the programme includes an element of Shift2Rail which is a European programme. Network Rail have told us that whilst there is uncertainty over the ongoing programme after Brexit, the proposed schemes are part of an arrangement between infrastructure owners and so are not expected to be affected.

3.30. We consider that there is scope for timetabling and wider performance improvements to have a higher profile within the R&D portfolio and we would expect this to be considered by the proposed R&D advisory board.

3.31. We expect Network Rail to continue to ensure that the economic and other benefits of R&D activities are distributed across all of the regions of Great Britain, so as to promote long-term value-for-money.

Conclusions

3.32. We determine that Network Rail's proposals for R&D are well founded and supported by a reasonable outline governance framework. A budget of £245m should therefore be allowed for R&D related to operations, maintenance, renewals and support activities in CP6.

3.33. We require Network Rail to formalise its proposed governance arrangements and apply these to the R&D programme before the start of CP6. In connection with this, the advisory board should review and confirm the programme of activities before it commences.

3.34. Matched funding is a very important aspect of the programme. We require Network Rail to take urgent action to secure significant levels of third party funding and to tailor its R&D programme to reflect the availability of this money. We will engage with Network Rail and monitor progress in this area.

Significant changes since draft determination

No.	Subject	Affected paragraphs
1	This is a new section which reviews Network Rail's proposals for R&D as submitted in response to the draft determination	All

4. Operations costs

4.1. These costs cover day to day operations carried out by staff such as signallers and mobile operations managers (in total, about 11% of Network Rail's proposals).

Assessment criteria

4.2. The following question framed the assessment of this area:

Are pre-efficient costs for operations reasonable and based on meeting performance requirements, i.e. Network Rail's plans for operating the network during CP6 are consistent with:

- maintaining the existing network capability;
- maintaining or improving utilisation of the network; and
- achieving train service performance levels discussed with operators?

Context

4.3. Operations costs are largely determined by staffing levels and remain broadly constant over a control period unless there are specific plans to reduce headcount. The most significant opportunities for headcount reduction would come about as new technology is introduced, such as traffic management and digital signalling systems.

Table 4.1 - Summary of operations costs

Route	CP5	CP6	2018-19	2019-20	2020-21	2021-22	2022-34	2023-24
	£m	£m	£m	£m	£m	£m	£m	£m
Anglia	255	271	46	57	53	53	53	53
LNE&EM	604	511	120	104	104	103	101	100
LNW	799	837	175	166	167	168	168	168
South East	565	654	103	135	133	130	129	127
Wales	205	207	45	42	42	41	41	41
Wessex	189	215	40	43	43	43	43	43
Western	240	315	55	64	64	63	63	62
Scotland	254	227	50	48	46	45	44	44
Central	73	47	12	11	9	9	9	10
GB total	**3,183**	**3,284**	**646**	**668**	**660**	**655**	**652**	**649**

Source: Network Rail Consolidated Opex databook, 2017-18 prices, post-efficient

4.4. In broad terms, Network Rail's plans showed an increase in year one with a marginal reduction each subsequent year, returning to existing levels by the end of the control period. These costs have been based on pay rates for staffing levels in the disciplines that compromise the operations teams, which are:

- signaller,

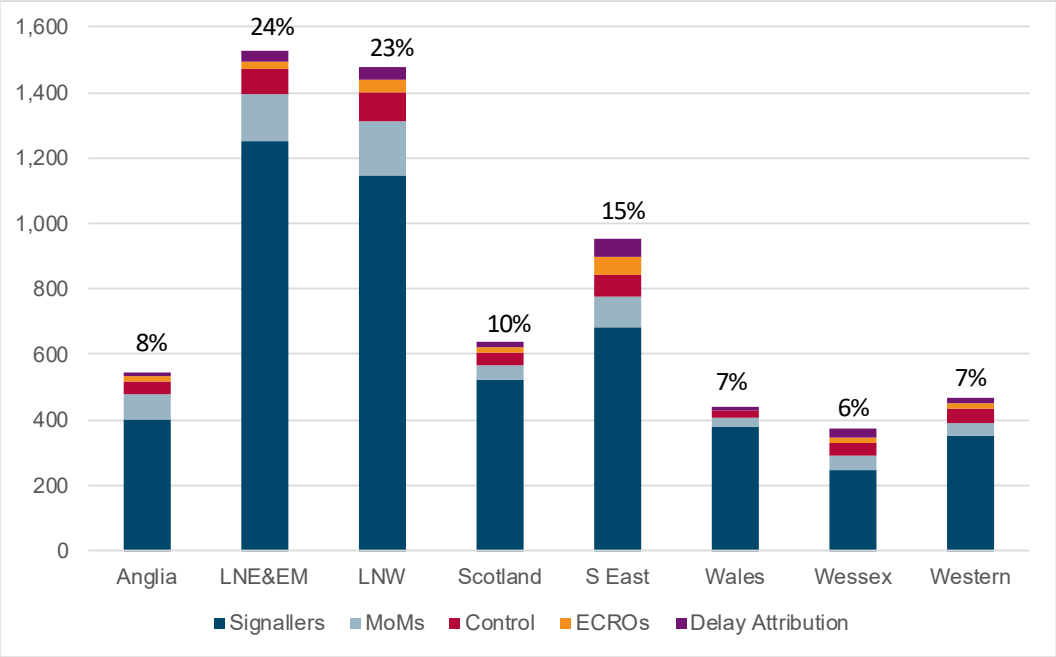
- electrical control room operator (ECRO),
- mobile operations manager (MOM), and
- controllers and trust delay attribution staff (TDA).

4.5. Network Rail's plans included about 6,400 operations staff (see Table 4.2 and Figure 4.1). The largest category was signallers, which made up nearly four in every five operational staff.

Table 4.2 - Staff employed in operations roles

Category	Number	% of total
Signallers	4,969	77%
MOMs	648	10%
Controller	414	6%
Delay Attribution	206	3%
ECROs	188	3%
Total	**6,425**	**100%**
Source: Network Rail		

Figure 4.1 - Employees by category and by route (% of total)



Source: Network Rail

4.6. Signallers, control the movement of trains, ensuring there is a safe environment for trains and railway staff to operate. Their level of work varies from location to location depending on factors such as the intensity of the train service, the type of signalling control system (e.g. mechanical lever frame, integrated electronic control centre),

the span of control, and the equipment under their control such as level crossings. Workload variation is factored into pay grades.

4.7. ECROs, are responsible for the electrical feed that powers trains, ensuring a consistent and reliable energy source is available, and responding appropriately to any disruptions. A key part of this role is to ensure a safe environment for other staff who need to access the railway network for maintenance, renewal and incident response.

4.8. MOM**,** is a multi-purpose role including a first responder role to incidents on the rail network (such as asset failures). In many cases they are the first point of call for frontline information needed to recover train services when incidents happen. When on site they are normally appointed as the Rail Incident Officer, acting as the co-ordinator responsible for the safe management of activity on the ground.

4.9. Controllers**,** provide command and control to railway operations. In many locations, Network Rail and train operators have co-located teams in a single Integrated Control Centre (ICC). The core Network Rail roles are the Route Control Manager (leading the shift teams), Incident Controller (managing incidents) and Train Running Controllers (optimising real time train service delivery). In addition, some routes have 'Very Short term Timetable Planning' roles (managing late changes to the train plan) and Information Controllers (managing the information flow to customers).

4.10. Delay Attribution**,** staff administer the systems that allocate the causes of train delays, to either Network Rail or the train operator, and identifies primary causes of the delay. This information feeds through to analysis for performance planning and also schedule eight payments (payable at times of unplanned disruption on the network).

Methodology

4.11. In 2013, we determined efficient costs by comparing Network Rail's costs with European benchmarks combined with a detailed review of its bottom up efficiency plans (known as the Network Operating Strategy (NOS)). The NOS was a long-term plan for consolidating signalling centres, introducing digital signalling and new traffic management systems. This would have resulted in a reduction in headcount in CP5 and beyond. However, these original plans were superseded by events in CP5, notably Network Rail's transformation programme and the deterioration in train service performance levels.

4.12. This has meant that we have adopted a different approach for PR18. Network Rail provided details of the proposed staffing levels and this was reviewed against our judgement of optimal levels. A more detailed review was undertaken for the largest

signalling centres in LNE&EM and South East, which provided more information to support the breakdown of costs.

Findings

Determinants of staffing levels

4.13. Signallers and ECROs made up over 80% of Network Rail's operations costs in its SBPs. In determining staffing levels for these activities, we found that routes are constrained by standards that are important for the safe operation of the railway. For example, a single person signal box that operates 24 hours a day all year round would require 8,760 hours of staff time. After accounting for annual leave, bank holidays, training, and average sickness rates, a signaller on a 35-hour working week would be available for 1,400 hours per year. This would equate to 6.25 staff members being required to operate the signalling. However, additional factors must then be factored into determining the required staffing:

- sufficient breaks to maintain concentration where high workloads occur (for example, at panels which control the approaches to busy terminus stations);
- compliance with Network Rail's 'fatigue index' policy, which includes a 14 hour maximum limit between leaving and returning home.

4.14. Routes have more leeway to set local levels of staffing for the other roles as there are no specific requirements that calculate a minimum or maximum. However, these roles are key to train service performance (punctuality and reliability) which means each route will have an idea of what level is appropriate based on operating experience and business requirements.

Route comparisons

4.15. We tested whether Network Rail had broadly matched route based employees with workload by making a high level comparison of the route allocations with traffic levels (as indicated by train kilometres). This showed that it generally had.

Table 4.3 - Route employee allocation and train kilometres

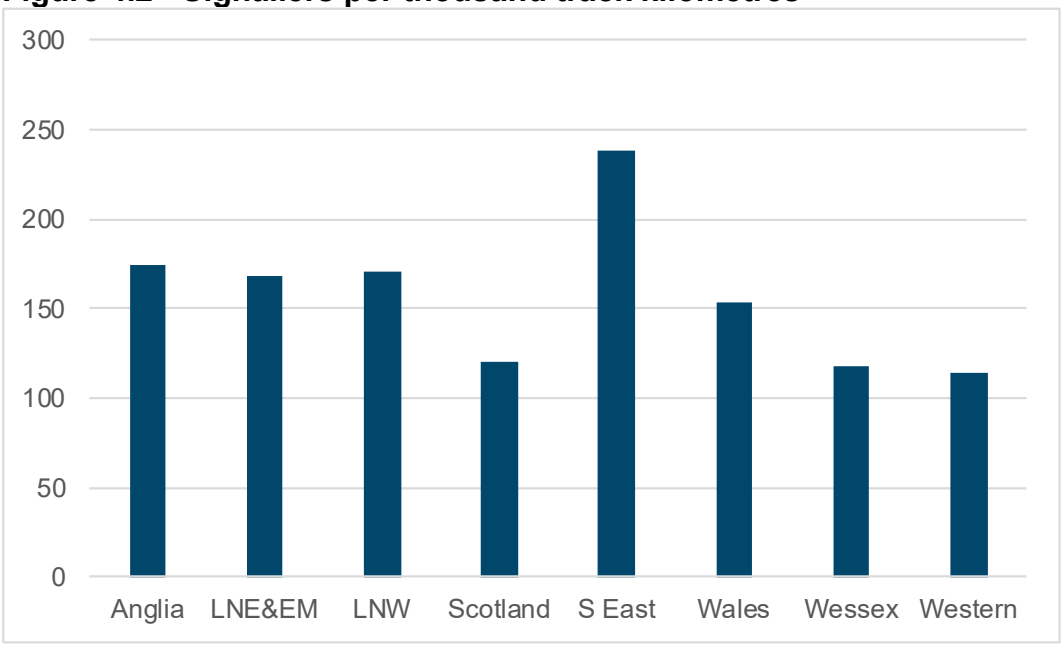
Route	% GB employees	% GB train kms	Difference in percentage points
Anglia	8	9	-1
LNE&EM	24	21	+3
LNW	23	23	0
Scotland	10	11	-1
SE	15	13	+2
Wales	7	5	+2
Wessex	6	9	-3
Western	7	9	-2

Route	% GB employees	% GB train kms	Difference in percentage points
Source: Network Rail			

4.16. We reviewed the number of signallers per thousand track kilometres. This was based on the premise that average service levels being equal, the length of track being controlled was a key driver for signaller staff levels. We found that that South East has the highest ratio (see Figure 4.2), and had more signallers than any other route in its plan. We understand that this is because:

- it is the most intensively used route (along with Anglia and Wessex routes) with the largest number of passenger journeys; and
- it does not have the same level of operational flexibility as Wessex route which has grade separated junctions at critical locations and Anglia route which has a self-contained section for c2c[43].

Figure 4.2 - Signallers per thousand track kilometres

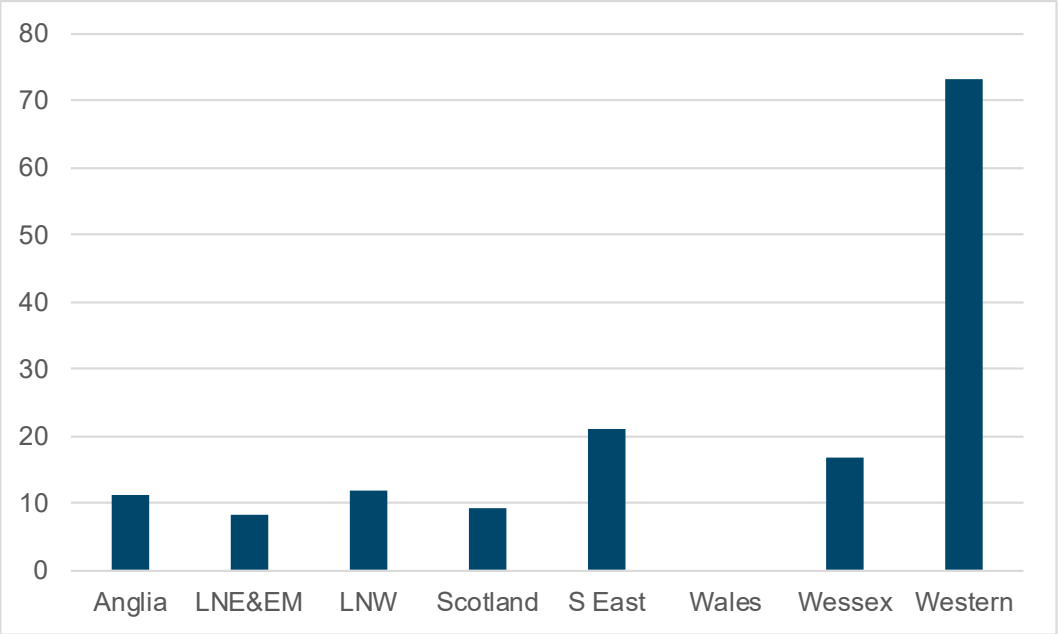


Source: Network Rail

4.17. For ECROs we reviewed the number of staff per 1,000km of electrified track – see Figure 4.3. This shows that Western has the highest level of ECROs which is because this analysis has not normalised the rates to account for Great Western electrification.

[43] The passenger train operator providing services between London Fenchurch Street and Shoeburyness in part of Anglia route

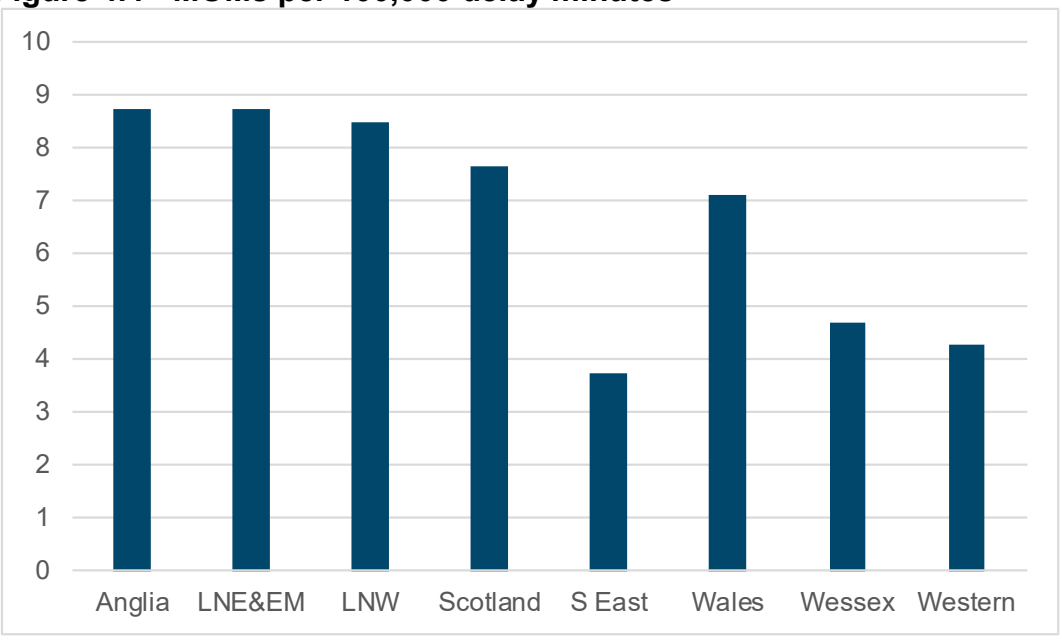
Figure 4.3 - ECROs per thousand electrified track kilometres



Source: Network Rail

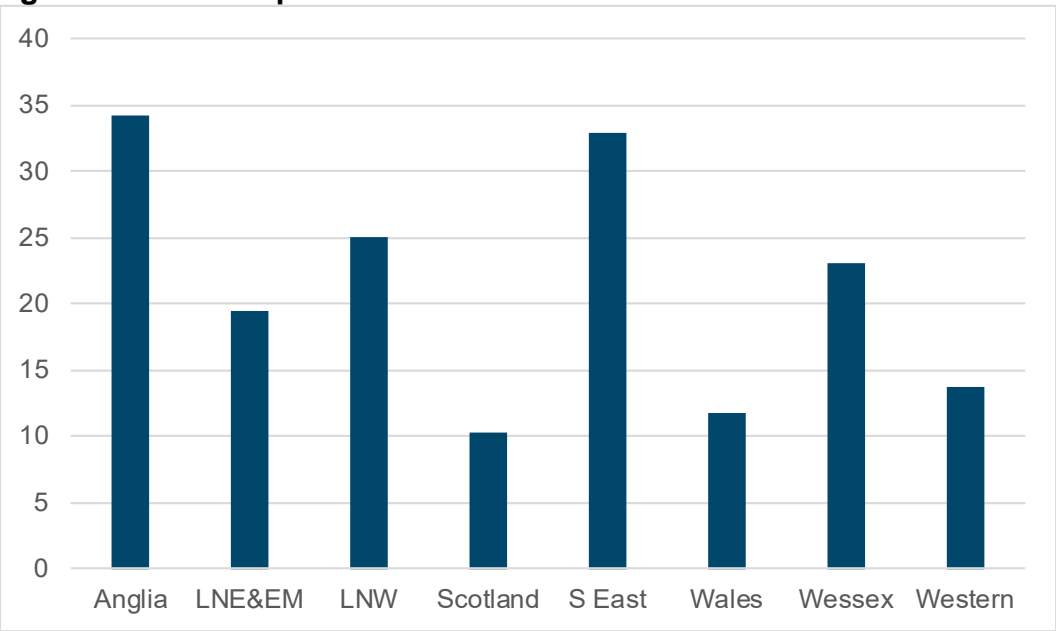
4.18. For MOMs we compared the number of MOMs per 100,000 delay minutes on the route (see Figure 4.4). This showed that Anglia, LNE&EM, Scotland, Wales and LNW routes had the most MOMs relative to the amount of delay whereas South East route had the least. We also looked at the number of MOMs relative to the size of the route (see Figure 4.5). This showed that South East and Anglia routes had most MOMs compared to route KMs, and Scotland and Wales routes had the fewest.

Figure 4.4 - MOMs per 100,000 delay minutes



Source: Network Rail

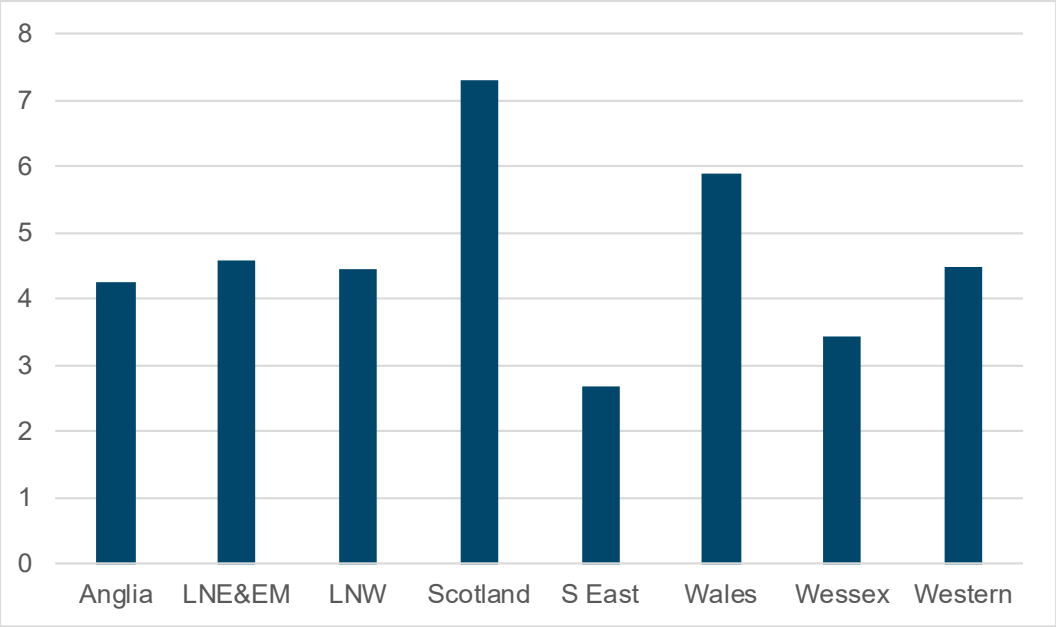
Figure 4.5 - MOMs per thousand kilometres



Source: Network Rail

4.19. For Controllers we examined the number of staff per 100,000 delay minutes on the route (see Figure 4.6). This showed Anglia, LNE&EM, LNW and Wales routes had the most controllers relative to the amount of delay that occurred, while Scotland and South East routes had the fewest.

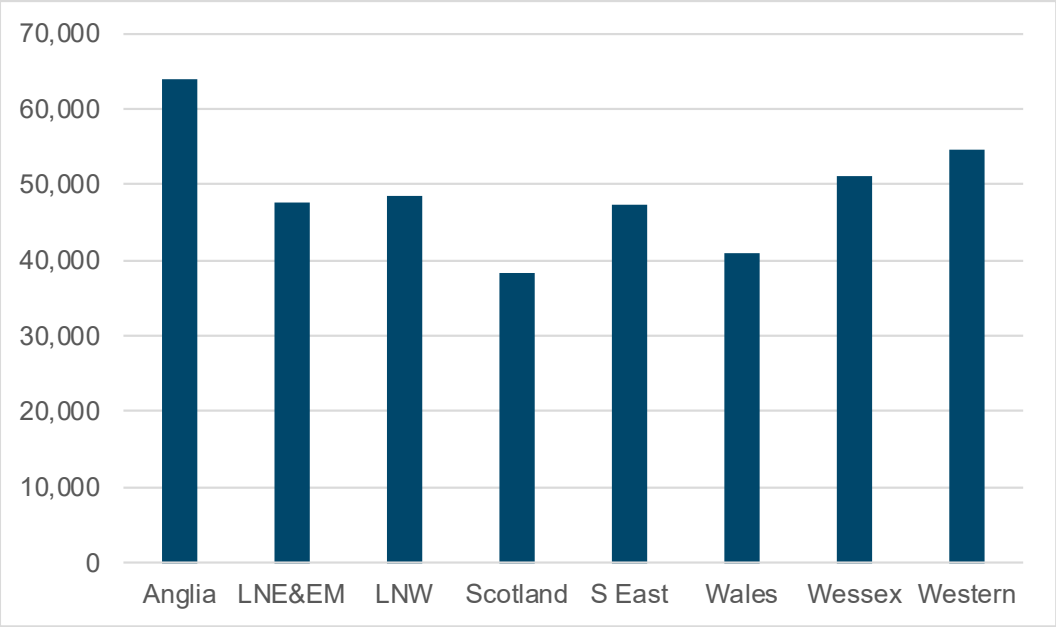
Figure 4.6 - Controllers per 100,000 delay minutes



Source: Network Rail

4.20. For Delay Attribution (DA) staff we divided the number of delay minutes by the number of DA team members (see Figure 4.7). This showed that Scotland's DA team had most, and LNE&EM's DA team had the least.

Figure 4.7 - Delay minutes per Delay Attribution team member



Source: Network Rail

Examination of signalling centres

4.21. We examined staffing levels at a sample of Network Rail locations, namely the signalling centres at Didcot, Three Bridges and West Midlands. We took the amount of signalling hours required (i.e. the hours a panel/ signal box was open during a year) and divided this by the amount of hours that a signaller would productively work in a year (base contractual hours minus time for leave/ training etc.). Based on the ratio of 6.25 signallers per panel/signal box we found that the levels of signalling staff at the selected locations were broadly in line with this.

4.22. The Three Bridges location had more staff which reflected the intensity of the network controlled by Three Bridges. This includes the approaches to London on the South East route, which is one of the most congested locations on the network. The intensity of this work increases stress and workload on signallers, meaning additional relief staff are required to keep the workload at a safe and manageable level.

Deep dives

4.23. To supplement our desktop analysis, we examined two routes LNE&EM and South East in more detail to understand how Network Rail had built up its organisational numbers. LNE&EM route operates a combination of long distance, commuter and regional services across a large area. South East route operates an intensely used, commuter-orientated network.

LNE&EM

4.24. The headcount forecast was developed from a baseline. It was then adjusted to full time equivalents for confirmed ROC migration schemes for CP6, the main schemes

being: Beighton, Woodhouse and Woodburn, Durham Coast re-signalling, Middlesbrough, Whitehouse, Cutsyke, Ferrybridge and Prince of Wales. MOM coverage was not changed.

4.25. Staff numbers were reduced by the merger of resourcing teams (i.e. all roster clerks being placed under one resourcing manager) and the reduction of staff through a review of general purpose relief signaller boundaries and flexibility premiums.

4.26. Additional staff were added to support franchise commitments, typically longer route opening hours across the Northern Rail network and earlier opening on Sundays. In some locations, such as Hull to Selby, this drove a change to rosters.

4.27. The new fatigue standard has impact on locations where there are 12-hour rosters. Additional staff were also provided for increased security check requirements at Leeds station to comply with the new security standard. The introduction of traffic management is supported with new train running controller posts but these numbers will be reduced in the latter part of CP6.

South East

4.28. To set the CP6 headcount, South East route took the CP5 staff establishment and actual headcount and overlaid this with an estimated headcount based on professional judgement to allow for CP6 re-signalling schemes. These include the completion of London Bridge re- signalling and Ashford IECC re-control.

4.29. The electrical Control room (ECR) strategy sees Traction Power Centralised Management System (TPCMS) rolled out in CP6 and this produces anticipated staff reductions through the closure of Canterbury, Lewisham and Selhurst ECRs, and concentration into Paddock Wood and Brighton. These changes are being facilitated by the TPCMS new SCADA (Supervisory Control and Data Acquisition) project.

4.30. The route has added staffing for the new Thameslink services and traffic management system, particularly in Control. It has also added the additional posts required to comply with Network Rail's new fatigue management standard.

4.31. In the support costs section below, we identify the requirement for a reallocation between operations and support costs. This does not affect the determination but will be required for monitoring purposes during CP6.

Conclusions

4.32. We have concluded that Network Rail's planned staffing levels and associated costs for CP6 are appropriate.

4.33. Based on the sample of signalling centres reviewed, we also found that Network Rail had broadly planned levels of staff in line with its standards or it could justify departures. We found that Network Rail's bottom up plans had accounted for local conditions in determining numbers of staff.

4.34. Nevertheless, we expect that operations costs should be kept under review during CP6 in light of new technology, enhancement schemes and other emerging factors. We will monitor Network Rail's progress with this during CP6.

Significant changes since draft determination

No.	Subject	Affected paragraphs
-	No change	-

5. Support and other costs

5.1. This chapter considers support costs, which include costs such as central human resources and information technology. We have also included some other costs, such as renewals undertaken by non-route functions.

Assessment criteria

5.2. The following questions framed the assessment that we applied to this area:

- are Network Rail's assumptions on pre-efficient costs reasonable, robust and well justified;
- are Network Rail's assumptions on efficiencies, headwinds and tailwinds reasonable, robust and well justified;
- do Network Rail's expenditure assumptions exclude amounts for financial risk; and
- has a reasonable process been used to allocate central and support costs to routes?

Context

Table 5.1 - Summary of support costs

Route	CP5	CP6	2018-19	2019-20	2020-21	2021-22	2022-34	2023-24
	£m	£m	£m	£m	£m	£m	£m	£m
Anglia	22	27	6	5	5	5	5	5
LNE&EM	30	100	3	20	20	20	20	20
LNW	52	60	12	12	12	12	12	12
South East	42	64	10	13	13	13	13	13
Wales	7	4	2	1	1	1	1	0
Wessex	15	43	4	9	9	9	9	9
Western	36	18	4	4	4	4	4	4
Scotland	31	56	8	11	11	11	11	11
Central	1,813	2,539	389	513	511	506	502	506
GB total	**2,048**	**2,911**	**437**	**588**	**586**	**581**	**576**	**580**

Source: Network Rail Consolidated Opex databook, 2017-18 prices, post-efficient

Table 5.2 - Support and other costs incurred by central functions and geographic routes

Function	Expenditure type	CP6 - post efficient costs					
		2019-20	2020-21	2021-22	2022-23	2023-24	Total
Communications*	Support costs	12	11	11	11	11	57
Finance*	Support costs	29	29	29	28	27	143
	Industry costs and rates	114	114	116	116	114	573
Human Resources*	Support costs	18	18	18	18	18	89
Legal and Corporate Services*	Support costs	7	7	7	7	7	34
Group*	Renewals	(26)	(26)	(26)	(26)	(26)	(130)
	Support costs	76	76	74	77	81	385
Asset Information Services*	Renewals	4	10	10	4	-	28
	Support costs	56	56	52	48	48	260
Property*	Renewals	42	66	67	91	133	399
	Support costs	13	13	13	13	13	65
	Industry costs and rates	217	217	217	301	301	1,252
Route Businesses HQ*	Support costs	12	12	12	12	12	59
Route Services Directorate *(1)	Renewals	260	258	231	207	194	1,150
	Support costs	119	115	112	106	106	558
System Operator	Renewals	8	12	21	13	6	61
	Support costs	41	42	43	43	42	211
STE	Renewals*	223	296	318	208	148	1,193
	Support costs*	41	41	42	43	43	211
	Industry costs and rates*	455	495	514	527	548	2,540
Digital Railway(2)	Renewals	36	26	22	25	24	133
	Support costs	87	89	91	94	96	457
Route-incurred support costs*	Support costs	75	75	75	74	74	372
Other	Support costs	2	2	2	2	2	10
Total costs	**Renewals**	**547**	**641**	**644**	**522**	**478**	**2,833**
	Support costs	**588**	**586**	**581**	**576**	**580**	**2,911**
	Industry costs and rates	**786**	**826**	**846**	**943**	**963**	**4,365**
	Total expenditure	**1,921**	**2,053**	**2,071**	**2,042**	**2,022**	**10,108**

Source: Network Rail SBP consolidated Opex and Renewals databooks, 2017-18 prices, post-efficient

* Function included in sample considered in detail below.

(1) This includes £119m of Digital Railway programme costs.

(2) This includes £180m of Digital Railway programme costs. These items are discussed later in this document.

5.3. Table 5.1 sets out a summary of support costs by route. These costs make up about 10% of Network Rail's OSMR) costs and industry costs and rates. Table 5.2 combines support costs with costs from other categories, such as renewals and industry costs included in the scope of our assessment.

5.4. Support costs include functions such as finance and human resources, as well as railway-specific business activities that Network Rail undertakes centrally for the routes. The majority of these costs are incurred by central functions, e.g. route services, however some support costs are incurred directly in routes.

5.5. It also includes industry costs and rates for the whole of Network Rail. £573m has been included in the finance function largely for British Transport Police (BTP) costs, RSSB costs and ORR fees. The £1,252m in the property function is for business rates.

5.6. Given the nature of the costs mentioned in paragraph 5.4, i.e. they are largely non-controllable by Network Rail, we have reviewed them for reasonableness but we have not assessed them. It also does not include the costs of Infrastructure Projects, the SO and FNPO.

5.7. Numbers may not add up in the following tables due to rounding. For CP5, Network Rail has not yet identified on a consistent basis the efficiencies and headwinds for the business units shown in the tables, so we have put n/a in the tables. Some of the numbers in the tables that are sourced from its strategic plans do not agree with some of the numbers in its supporting databooks.

5.8. The numbers in this section are net of other operating income, which we have separately analysed below.

Methodology

5.9. Network Rail commissioned Gartner, Hackett and PwC to inform its route services strategic plan. Similar work by Hackett was also used by finance and human resources. We reviewed this work and concluded that we could use their findings to inform our analysis rather than employing our own consultants to externally benchmark Network Rail's activities. This work was mainly commissioned by Network Rail to inform its improvement planning. Network Rail has also submitted it to us as one part of its evidence base for PR18 which informed its efficiency assumptions.

5.10. Our review of the strategic plans focussed on the most material areas, in terms of both overall expenditure, and criticality to the success of CP6 as a whole. We therefore divided our work into:

- a programme of structured deep dives; and
- desk top reviews of SBPs, with subsequent follow-up queries by correspondence.

5.11. Table 5.3 shows how we approached the assessment.

Table 5.3 - Approach to our assessment of the SBPs

Support cost / central function	Desktop review & follow up correspondence	Deep dive reviews
Communications	✓	
Finance	✓	
Human Resources	✓	
Legal and Corporate Services	✓	
Other operating income	✓	
Traction electricity		✓
Group		✓
Asset Information Services		✓
Property		✓
Route Businesses HQ	✓	
Route Services Directorate		✓
Safety Technical & Engineering		✓
Route-incurred support costs	✓	

5.12. Our review of route services involved deep dives looking at: procurement, supply chain operations (Network Rail's logistics function), information technology, traction electricity, insurance, risk & uncertainty and wheeled plant. Overall, our programme of deep dives covered over 75% percent of Network Rail's support and other costs.

Findings

Pre-efficient costs

5.13. We have assessed Network Rail's pre-efficient support and central function costs. We found its assumptions were largely reasonable. However, we consider two issues that Network Rail has called headwinds in the supply chain and operations elements of the route services directorate, should be treated as changes to pre-efficient expenditure (£23m), i.e. pre-efficient expenditure has been understated. We also think that pre-efficient expenditure has been overstated by £4m in legal and corporate Services. The net effect of this is £19m.

Efficiencies, inefficiencies, headwinds and tailwinds

5.14. In our review, we assessed the efficiencies, inefficiencies, headwinds and tailwinds associated with support and other costs across the business and found that Network Rail had overstated the costs of delivering its plans and had not adequately justified its efficiencies, inefficiencies and headwinds. It had also not identified sufficient headwinds.

5.15. We detail below the findings of our bottom-up review of Network Rail's support and other costs. In total, our bottom-up review identified £78m of costs that we consider Network Rail included in addition to the efficient cost of delivering the outputs of the HLOS. We used this finding to support the efficiency challenge which we set for Network Rail in the draft determination and the results are discussed in our conclusions below.

5.16. The £78m arises because we think Network Rail has not adequately justified its forecast inefficiencies and headwinds (£76m) and has excluded some tailwinds (£21m), in total this is £97m (as shown in Table 5.33). This is offset by issues with pre-efficient expenditure of £19m as described above.

5.17. Network Rail has not yet identified on a consistent basis the headwinds or tailwinds it may have experienced in CP5 (as shown below in the tables). It has not forecast any tailwinds in support and other costs and we did not find this to be credible. On the other hand, it did forecast around £100m of inefficiencies and headwinds (including on the items route services buys for the routes). We have concluded that this imbalance between headwinds and tailwinds distorts Network Rail's plans and understates the efficiencies that could be achieved. This weakens its argument for saying that the headwinds it thinks it will face in CP6 are incremental to the level of CP5 expenditure, which it has used as the CP6 pre-efficient baseline.

5.18. We consider that Network Rail has potential to make significant improvements in efficiency across the whole of its support costs and other costs.

5.19. In the section below, we consider Network Rail's support costs and other costs by function, e.g. communications and finance.

Network Rail's response to the draft determination

5.20. We received a number of responses in relation to support and other costs, our views on those responses are included in a separate summary document[44].

[44] Consultation on the draft determination –Summary of comments and our response, ORR, October 2018.

Functional analysis

Communications

Table 5.4 - Network Rail Communications strategic plan

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	15	13	10	11	10	58	10	10	10	10	10	48
Plus: Inefficiency[45]	n/a	n/a	n/a	n/a	n/a	n/a	2	2	2	2	2	9
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0	0	0	0
Post-efficient cost	**15**	**13**	**10**	**11**	**10**	**58**	**12**	**11**	**11**	**11**	**11**	**57**
Source: Network Rail SBP consolidated Opex databooks, 2017-18 prices, post-efficient												

5.21. Network Rail's communications function provides internal and external communication services to the routes and centre[46].

5.22. Network Rail included an 'inefficiency' in its strategic plan of £10m (around 20% of the total cost of the business function) as it anticipates spending more money on media campaigns, including 'Britain Runs on Rails'. Network Rail was unable to demonstrate that this was not double counting the expenditure in its pre-efficient baseline, given that a similar campaign took place in CP5. We used this finding to support the efficiency challenge which we set for Network Rail in the draft determination and the results are discussed in our conclusions below.

[45] Network Rail's SBPs included this cost as an 'in efficiency', although other submissions call this cost a headwind. We have followed the presentation in Network Rail's SBPs for consistency.
[46] For the avoidance of doubt, communications includes media affairs, investor and government relations. It does not include the costs of operating and maintaining telecommunications infrastructure.

Finance

Table 5.5 - Network Rail Finance strategic plan – support costs

	CP5						CP6					
£m, 2017-18 prices	2014 -15	2015 -16	2016 -17	2017 -18	2018 -19	Total CP5	2019 -20	2020 -21	2021 -22	2022 -23	2023 -24	Total CP6
Actual / pre-efficient base line	21	25	33	38	38	154	30	30	30	30	30	149
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0	0	0	2
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	-1	-1	-1	-2	-3	-8
Post-efficient cost	**21**	**25**	**33**	**38**	**38**	**154**	**29**	**29**	**29**	**28**	**27**	**143**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

Table 5.6 - Network Rail Finance strategic plan – industry costs and rates

	CP5						CP6					
£m, 2017-18 prices	2014 -15	2015 -16	2016 -17	2017 -18	2018 -19	Total CP5	2019 -20	2020 -21	2021 -22	2022 -23	2023 -24	Total CP6
Actual / pre-efficient base line	90	108	114	112	110	533	114	114	116	116	114	573
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Post-efficient cost	**90**	**108**	**114**	**112**	**110**	**533**	**114**	**114**	**116**	**116**	**114**	**573**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

5.23. The finance strategic plan included the costs of Network Rail's finance teams, including: group finance function, business review, planning and regulation, internal audit and treasury teams. It did not include the shared service centre that handles accounts payable, accounts receivable and other finance functions, these are included in the route services directorate.

5.24. Our review confirmed that the pre-efficient costs are based on the existing CP5 structure, adjusted for fewer asset sales (which require resource to plan and administer) in CP6.

5.25. Hackett benchmarked the wider finance function, including those parts within the route services directorate. Its review covered the cost of activities like accounts payable and the general cost of running the finance function, e.g. finance staff costs. One of its findings was that the number of invoices processed per

Network Rail staff member was lower than its peer group. It found that Network Rail was broadly effective, but that further efficiency savings were possible. Network Rail's finance strategic plan includes a 9% cumulative efficiency across CP6.

5.26. A number of cost pressures have been identified by Network Rail. However, it noted that none meet the certainty threshold to be included as a headwind.

5.27. The finance strategic plan includes the cost of Network Rail's British Transport Police costs (£464m), RSSB costs and ORR fees. The BTP costs are outside the scope of the SoFAs and PR18 in both England & Wales, and Scotland. We have reviewed them at a high level for reasonableness, but these costs are not within the scope of our detailed review.

Human Resources

Table 5.7 - Network Rail Human Resources strategic plan

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	19	17	17	19	19	91	19	19	19	19	19	96
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	-1	-1	-1	-1	-1	-7
Post-efficient cost	**19**	**17**	**17**	**19**	**19**	**91**	**18**	**18**	**18**	**18**	**18**	**89**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

5.28. The human resources strategic plan included the costs of Network Rail's human resources business partners, 'people managers', and human resources centres of excellence. It excluded the costs of human resources shared services (payroll, employee records, medicals), which are part of the route services directorate.

5.29. Our review confirmed that the pre-efficient baseline for the human resources function has been based on existing CP5 costs (2017-18), taking into account further cost savings in the last year of CP5 (2018-19).

5.30. The wider human resources function, including those parts within the route services directorate, were benchmarked by Hackett. Its review covered the costs of activities like recruitment and payroll. One of its findings was that Network Rail's cost of recruiting people is significantly higher than its peer group.

5.31. Hackett found that Network Rail was broadly effective, but that further efficiency savings were possible. Network Rail's human resources strategic plan includes a cumulative 6.9% efficiency across CP6.

5.32. No headwinds were included in the human resources strategic plan. A number of cost pressures have been identified by Network Rail, although the company notes that none meet the certainty threshold to be included as a headwind.

5.33. We reviewed Network Rail's human resources efficiencies. We found that these were not appropriately phased across the control period and Network Rail agreed with this. However, we do not consider this a sufficiently material issue to adjust.

Legal and Corporate Services

Table 5.8 - Network Rail Legal and Corporate Services strategic plan

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	6	6	5	6	7	30	7	7	7	7	7	34
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0	0	0	0
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0	0	0	0
Post-efficient cost	**6**	**6**	**5**	**6**	**7**	**30**	**7**	**7**	**7**	**7**	**7**	**34**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

5.34. The legal and corporate Services strategic plan included the costs of Network Rail's:

- company secretariat;
- legal services - Transparency, Ethics, Data Protection and FOI functions;
- legal services; and
- legal policy and assurance.

5.35. It included both the employment cost of Network Rail's in-house staff, as well as costs arising from the use of external legal advisors.

5.36. We consider that Network Rail has likely overstated its CP6 pre-efficient assumption by £4.2m in the SBPs because it rolled forward forecast expenditure in the final year of CP5, and did not appropriately justify the increase in expenditure compared to the average level in CP5.

5.37. Our review of the legal and corporate services strategic plan identified that it included c£750k of headwinds for future procurement risk. We consider this increase should be treated as a risk item, as there is no certainty that it will materialise.

5.38. We used these findings to support the efficiency challenge which we set for Network Rail in the draft determination and the results are discussed in our conclusions below.

Group

Table 5.9 - Network Rail Group strategic plan - support costs

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	(25)	(14)	(51)	25	36	(29)	76	76	74	77	81	385[47]
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Post-efficient cost	**(25)**	**(14)**	**(51)**	**25**	**36**	**(29)**	**76**	**76**	**74**	**77**	**81**	**385**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

Table 5.10 - Network Rail Group strategic plan - Renewals expenditure[48]

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	1	20	(9)	10	3	25	(26)	(26)	(26)	(26)	(26)	(130)
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Post-efficient cost	**1**	**20**	**(9)**	**10**	**3**	**25**	**(26)**	**(26)**	**(26)**	**(26)**	**(26)**	**(130)**
Source: Network Rail SBP consolidated Renewals databook, 2017-18 prices, post-efficient												

5.39. Network Rail's group strategic plan included a diverse range of central (non-route) business activities. We comment on the whole of this plan here even though some of the costs are included in the operations and maintenance numbers shown elsewhere in this document. These costs, include:

- insurance and risk;
- reorganisation costs;

[47] The insurance costs in this table are before the adjustment for Schedule 8 costs.
[48] Note: CP5 and CP6 costs are not strictly like-for-like due to changes in the composition of the items that constitute Group Renewals.

- payroll costs arising from the difference between the days in the year and the days recorded by Network Rail's accounting system[49] (known as 'payroll day' costs);
- Network Rail (High Speed) re-charges; and
- the re-charge of operating expenditure to capital projects, i.e. 'project off charges'[50].

5.40. Group costs vary considerably within CP5 due to variations in the level of project off-charges that occur each year.

5.41. We have reviewed Network Rail's group strategic plan, separately scrutinising each material area of expenditure:

- insurance and risk (£385m) as shown in Table 5.9: We note Network Rail's approach to insurance is changing in CP6, and consider that its costs are based on a reasonable approach, minimising the costs of insurance and the underlying risk portfolio. Insurance costs are analysed in more detail below.
- reorganisation and 'Payroll day' costs (£185.5m): We reviewed Network Rail's assumption for reorganisation costs and payroll date. We recognise that these figures are essentially estimates, but that these are based on reasonable assumptions around changes in staffing numbers and average salaries over CP6. These costs are not included in support costs but are included elsewhere in the plans, e.g. operations, maintenance and renewals as appropriate.
- Network Rail (High Speed) recharges (£15.5m): This is Network Rail's re-charges to Network Rail (High Speed).
- project off-charges: Renewals costs include £130m of project off-charges (as shown in Table 5.10), £23.6m is included elsewhere in the plans. In 2018-19, total recharges from Infrastructure Projects was £38.1m. Network Rail has assumed the recharges will be lower in CP6 due to the reduced size of the IP function. Before our draft determination, we reviewed Network Rail's approach for estimating project off-charges. After our draft determination, we discussed with Network Rail whether the targeted update exercise and the increased renewals forecasts would change the project off-charge assumption. We have agreed with Network Rail that the assumption is still reasonable given the way the recharge process works.

[49] Across the rail industry, the year is divided into 13 accounting periods of 28 days, i.e. 364 days. Salary costs for the remaining day in the year are not captured conventionally in Network Rail's accounting systems, and are instead charged to the 'Group'.
[50] When Network Rail invests on the rail network, the cost of the project includes both the capital costs (i.e. a bridge), and the operating costs required to complete the capital project (i.e. architects fees). "Project off charges" are costs designed to ensure the total cost of rail investment includes the associated operating costs.

Insurance

Table 5.11 - Network Rail Insurance strategic plan[51]

	CP5						CP6					
£m, 2017-18 prices	**2014 -15**	**2015 -16**	**2016 -17**	**2017 -18**	**2018 -19**	**Total CP5**	**2019 -20**	**2020 -21**	**2021 -22**	**2022 -23**	**2023 -24**	**Total CP6**
Actual / pre-efficient base line	(25)	(14)	(51)	25	36	(29)	76	76	74	77	81	385
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Post-efficient cost	**(25)**	**(14)**	**(51)**	**25**	**36**	**(29)**	**76**	**76**	**74**	**77**	**81**	**385**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

5.42. Network Rail has different types of insurance designed to deal with different risks across the business. These costs are managed centrally. Additionally, in CP6, Network Rail will have risk funding to efficiently deal with risks when they arise. Risk funding will be held at both group and route level.

5.43. In its SBPs, Network Rail has also included £225m in schedule four costs for the risk of centrally-managed external events, such as bad weather, based on the claims history of the past five years. These costs are recovered through the Access Charges Supplement (ACS).

5.44. Network Rail also included £50m in schedule eight costs. This included some insurance related costs. Following discussions with Network Rail, we have now agreed that these costs should be included in insurance costs in this document and in the calculation of the revenue requirements. Included within the table below, cover for third party damages is £20m and £30m is for additional construction insurance costs (bringing the total to £74m). This means that total insurance costs are £435m (£385m plus £50m).

5.45. Table 5.12 below shows insurance costs by the type of insurance.

[51] The CP6 insurance costs in this table are before the adjustment for Schedule 8 costs.

Table 5.12 - Network Rail's total forecast insurance costs in CP6 by type of insurance (after Schedule eight adjustment)

Type of Insurance	Premium value (including IPT[52]), £m, 2017-18 prices
Property / Business Interruption (External)	62
Property Self-Insured	200
Total Property	**262**
Public Liability	54
Motor	16
Employers Liability	26
Construction All Risks	74
Other	3
Total	**435**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient.	

5.46. Table 5.13 splits the total insurance costs in Table 5.12 by route.

Table 5.13 - Network Rail insurance costs allocation by route in CP6

£m, 2017-18 prices	Anglia	LNE&EM	LNW	South East	Wales	Wessex	Western	Scotland	Total
Insurance costs	38	104	106	46	24	29	40	49	435
Source: Network Rail, 2017-18 prices, post-efficient									

5.47. Our review of insurance included assessing the external insurance premium assumptions, considering the accruals process for claims, and the consistency between insurance costs and risk funding. The following paragraphs consider each of these factors.

External insurance premiums

5.48. Network Rail's forecast insurance premium costs are based on information from third party insurance brokers. Network Rail's forecast insurance premium costs are £1m lower in CP6 than in CP5[53] due to a lower level of insurance cover being taken.

[52] IPT means Insurance Premium Tax.
[53] Overall, Insurance costs in CP5 were reduced by £52m following an actuarial reassessment of historical claims.

Claims accruals process

5.49. We engaged with Network Rail to understand the appropriateness of any insurance accruals for historic claims and to understand its review process to ensure accurate estimates.

5.50. Network Rail uses a third party actuary to assess the potential value of a claim. The expected claim value is recorded on the balance sheet. This is released when the insurance claim is settled and is subject to external review (currently done by PwC). Additional assurance is provided through the external statutory audit that considers the appropriateness of any accrual in line with applicable accounting standards. The external statutory audit is performed by the National Audit Office.

Consistency of insurance costs and risk funding

5.51. Each of the three types of insurance that Network Rail uses cover specific risks. External insurance covers legally or corporately mandated risks (such as vehicle insurance). Network Rail then self-insures other risks either by forecasting some costs at a group level and including that forecast in its business plans or formally having the risk covered by the captive (Network Rail Insurance Ltd).

5.52. Network Rail has two categories of risk funding. These are the group portfolio fund (GPF) held at the centre and route level funding (including both route-controlled risk funding and contingent asset management funding). Routes have responsibility for managing route level risk funding[54].

5.53. We reviewed Network Rail's SBP and supporting documentation to understand whether there is any risk of double counting between insurance costs and risk funding. This involved evaluating the purpose of each type of insurance that Network Rail uses to cover financial risk.

5.54. Apart from the movement of the costs included in Schedule eight to insurance costs, overall we consider that the total amounts Network Rail provided for risk funding and insurance costs in its SBPs are appropriate.

[54] The risk funding process is explained in our PR18 final determination document: "Supplementary document - Financial Framework".

Asset Information Services

Table 5.14 - Network Rail Asset Information Services strategic plan – support costs

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	41	38	36	38	38	191	56	56	54	50	50	266
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	1	1	1	1	1	5
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	(1)	(1)	(3)	(3)	(3)	(11)
Post-efficient cost	**41**	**38**	**36**	**38**	**38**	**191**	**56**	**56**	**52**	**48**	**48**	**260**
Source: Network Rail SBP consolidated Opex submission, 2017-18 prices, post-efficient												

Table 5.15 - Network Rail Asset Information Services strategic plan – renewals costs

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	-	-	-	-	-	-	4	10	10	4	-	28
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Post-efficient cost	**-**	**-**	**-**	**-**	**-**	**-**	**4**	**10**	**10**	**4**	**-**	**28**
Source: Network Rail SBP consolidated Renewals databook, 2017-18 prices, post-efficient												

5.55. Asset information services (AIS) provides Network Rail and the rail industry with insight, intelligence and reporting on railway network assets, allowing informed asset management and safety-related business decisions to be made.

5.56. Our review of asset information services noted that its pre-efficient support costs are increasing by around £75m in CP6. However, we concluded that this was largely due to the centralising of activities that were previously undertaken by routes. Network Rail has said that there is no cost increase across the overall business.

5.57. No tailwinds were identified by Network Rail in the SBPs. However, Network Rail central team's high-level analysis of input price inflation has indicated that IT costs (of which AIS is a part) are likely to track closer to CPI rather than RPI, which is the price base Network Rail presented its SBPs in. Reflecting this, we think there is a tailwind of £5m in AIS that is likely to materialise across CP6.

5.58. Our review of headwinds found that Network Rail had not adequately justified a headwind of £5m included in the strategic plan.

5.59. We used these findings to support the efficiency challenge which we set for Network Rail in the draft determination and the results are discussed in our conclusions below.

5.60. In the SBPs, Network Rail is proposing spending £28m renewing train-borne hardware on its track measurement vehicles. In CP5, there were no AIS renewals. Network Rail has said that its plan in this area is immature, partly because of the lack of activity in CP5 but also because it is purchasing bespoke assets. Reflecting this we have not identified any potential adjustments for these renewals.

Property

Table 5.16 - Network Rail Property strategic plan – support costs

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	33	16	21	32	15	116	11	11	11	10	9	52
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	2	2	2	4	4	14
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	(0)	(0)	(0)	(0)	(0)	(1)
Post-efficient cost	**33**	**16**	**21**	**32**	**15**	**116**	**13**	**13**	**13**	**13**	**13**	**65**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

Table 5.17 - Network Rail Property strategic plan - renewals

	CP5						CP6					
£m, 2017-18 prices	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**Total CP5**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**Total CP6**
Actual / pre-efficient base line	25	15	22	24	18	104	43	67	68	92	133	403
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	(1)	(1)	(1)	(1)	(1)	(5)
Post-efficient cost	**25**	**15**	**22**	**24**	**18**	**104**	**42**	**66**	**67**	**91**	**133**	**399**
Source: Network Rail SBP consolidated Renewals databook, 2017-18 prices, post-efficient												

5.61. Network Rail's Property strategic plan covered the activities and costs associated with operating and renewing the company's commercial property, i.e. retail, stations, development & sales, property services, planning & land services and the commercial estate. The function also provides workplace management services for offices and other facilities.

5.62. We reviewed Network Rail's property strategic plan, examining both renewals and support costs. We found that the support costs component of the property strategic plan was reducing in line with the anticipated disposals resulting from the potential sale of the commercial estate.

5.63. We have reviewed Network Rail's headwinds and efficiencies. Network Rail has included a £14m headwind in its strategic plan, due to a forecast reduction in other operating income arising from changes in the electronic telecommunication code 2017.

5.64. The strategic plan includes £403m of renewals expenditure. The expenditure is partly for renewals within the workplace estate but mainly relates to wider retail and station environment work and includes significant amounts of expenditure at some of the major stations towards the end of the control period. This compared to a total of £500m in CP5 (of which £396m was included as enhancements) and appears to be reasonable given the potential income it could generate.

5.65. We note the strategic plan includes £1,252m of industry costs and rates. This relates to business (cumulo) rates paid by Network Rail to central government. We have reviewed them for reasonableness but we have not assessed them, especially as the rates are paid to central government.

5.66. We have reviewed Network Rail's property strategic plan. Our view is that the forecast expenditure is reasonable given the potential income it could generate.

Route Business HQ

Table 5.18 - Network Rail Route Business HQ strategic plan – support costs

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient base line	-	-	-	-	-	-	12	12	12	12	12	62
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	(1)	(1)	(1)	(1)	(1)	(3)
Post-efficient cost	**-**	**-**	**-**	**-**	**-**	**-**	**12**	**12**	**12**	**12**	**12**	**59**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

5.67. Network Rail's route business HQ facilitates the operation of Network Rail's devolved business structure and includes network-wide finance, performance, transformation and incident management teams.

Route Services Directorate

Table 5.19 - Route Services Directorate strategic plan – support and renewals costs

Business function £m, 2017-18 prices	Expenditure type	CP5 total	Scope / Volume changes	CP6 pre-efficient	Headwinds	Efficiency	CP6 post-efficient
Route Services Directorate	Support	485	130	615	3	(60)	558
	Renewals	1,069	125	1,176	38	(64)	1,150
Total		**1,554**	**255**	**1,791**	**41**	**(124)**	**1,708**
Source: Network Rail SBP consolidated Opex and Renewals databooks, 2017-18 prices, post-efficient							

5.68. Route services directorate is the central function that manages a diverse portfolio of services utilised by routes. It is the largest central (non-route) function by expenditure after infrastructure projects, buying goods and services within route services and on behalf of the routes. The main components of route services are:

- information technology: the provision of hardware, software and mobile working devices to the routes and other central functions;
- business services: the provision of transaction-focussed human resources, finance and training services to the routes and central functions;
- supply chain operations: the provision of logistics, materials and wheeled plant to routes for maintenance and renewals; and
- contracts and procurement: the provision of procurement services to the routes and other central functions. Note: routes also have their own procurement teams.

5.69. Network Rail is reorganising how it provides services to its routes. To aid transparency, the table below identifies in more detail the different types of activities covered by route services and changes in the volume of these between CP5 and CP6.

5.70. The table above identifies the amount of expenditure in the route services directorate. However, the directorate also buys goods and services for the rest of Network Rail. The table below adds on that expenditure in supply chain operations support costs (£3,791m) and identifies the main different types of activity in the route services directorate.

5.71. The reconciliation between Table 5.19 and Table 5.20 is:

- total expenditure per Table 5.20 (£5,341m).
- less: supply chain operations support costs (£3,791m).

- add: digital railway programme fitment costs (£119m)[55].
- add: route services support, which covers managing director and support, finance, business systems and the transformation team (£39m).
- equals total route services directorate expenditure per Table 5.19 (£1,708m).

Table 5.20 - Route Services Directorate strategic plan

Business function £m, (2017-18 prices)	Expenditure type	CP5 total	Scope / Volume changes	CP6 pre-efficient	Headwinds	Efficiency	CP6 post efficient
Information Technology	Support	328	114	442	3	-19	426
	Renewals	565	-101	464	-	-27	437
Business Services	Support	143	-43	100	-	-39	61
	Renewals	-	10	10	-	-	10
Supply Chain Operations	Support	4,114	-159	3,955	19	-183	3,791
	Renewals	486	97	583	38	-38	583
Contracts and Procurement	Support	30	5	35	-	-2	33
Total	**Support**	**4,615**	**-83**	**4,532**	**22**	**-243**	**4,311**
	Renewals	**1,051**	**6**	**1,057**	**38**	**-65**	**1,030**
Total		**5,666**	**-77**	**5,589**	**60**	**-308**	**5,341**
Source: Network Rail SBP consolidated Opex and Renewals databooks, 2017-18 prices, post-efficient							

5.72. Table 5.20 above shows the route services directorate's expenditure, disaggregated by business function. There has been a significant degree of change in the organisation of route services at the end of CP5. In this table, we show the effect on CP6 of these scope/volume changes as well as the pre-efficient expenditure, headwinds and efficiencies.

5.73. The scope and volume changes were largely due to the following reasons:

- information technology (IT) – a change in accounting treatment of licences that are now treated as support costs instead of renewals.
- business services - a reduction of £43m in training costs in Route Services as these services have now been devolved to routes. There is also a £10m increase in capex due to expenditure on a training centre.
- supply chain operations – the support costs scope reduction of £159m is largely due to lower asset sales, lower enhancement work that is recharged to capital projects and CP5 efficiencies. The renewals increase of £97m is largely due to the timing of asset renewals work not being linked to control periods but asset lifecycles, as a number of assets will be older than their normal asset life, and need renewing in CP6.

[55] See Table 6.3.

- contracts and procurement – a support costs scope increase of £5m, which reflects the greater volume of work contracts and procurement anticipate undertaking in CP6.

5.74. Our review of route services included several deep dives focussed on reviewing and assessing the pre-efficient costs, headwinds and efficiencies. The following paragraphs consider each part of the route services directorate.

For Information Technology (IT):

- our engagement with the route services IT team included both dedicated deep dives, as well as meetings with Network Rail's consultants, Hackett and Gartner. The consultants' reviews covered the costs of IT per end user, including hardware and software costs and the cost of the service desk.
- Network Rail changed the classification of expenditure of licence costs between CP5 and CP6 and introduced a new expenditure category, 'IT Transformation'. This meant that initially its pre-efficient cost base was not clear. The main changes in CP6 are an increase in renewal of business applications to replace obsolete and non-secure software, and a general switch from 'buying' software, to leasing it. Overall, we think Network Rail's pre-efficient Information Technology costs are reasonable.
- our review of headwinds and efficiencies found that route services information technology had included in its strategic plan a programme of efficiencies that is envisaged to deliver £45m savings over CP6 (Network Rail has stated that this is similar to CP5 levels). This is consistent with the benchmarking evidence Network Rail used to inform its strategic plan. We reviewed this evidence in meetings with Hackett and Gartner and thought that it was a reasonable assumption.
- our review of headwinds noted a £3m headwind associated with parallel running and migration costs as a result of software renewals. However, we found that costs of this type have been incurred in CP5 as there have been similar changes to IT systems in CP5, so we think the cost has been double counted with the pre-efficient CP5 expenditure baseline brought forward into CP6.
- no tailwinds have been identified by Network Rail. However, Network Rail's analysis has indicated that IT costs are likely to track closer to CPI than RPI, which is the price base Network Rail presented its SBPs in. Reflecting this, we think there is a tailwind of £16m across CP6 in IT that is likely to materialise across CP6.
- we used these findings to support the efficiency challenge which we set for Network Rail in the draft determination and the results are discussed in our conclusions below.

For Business Services:

- our engagement with business services included both a deep dive, and a meeting with Network Rail's consultants, Hackett. Hackett's review covered the costs of activities like procurement.
- our review noted that the pre-efficient cost base is anticipated to reduce by a net £33m (see Table 5.20) between CP5 and CP6, reflecting, primarily, the impact of devolution of Network Rail's training budgets to routes. Overall, we have not considered it necessary to change Network Rail's pre-efficient business services cost base.
- we reviewed business services efficiencies. We consider a £39m cost saving on a £110m cost base to be an ambitious target. But overall we are content that this is reasonable.
- business services included no headwinds in its plan, which we consider broadly appropriate given the nature of these costs.

For Supply Chain Operations:

- our engagement with supply chain operations noted a number of changes in the pre-efficient costs between CP5 and CP6. In particular, there is a £42m increase in costs, due to lower asset sales than in CP5 because of changes in the asset portfolio managed (in CP5, this income from asset sales offsets the supply chain operation's costs). We note that, given the increase in wheeled plant renewals in CP6, Network Rail may be able to achieve further asset sales in CP6. However, due to the uncertainty involved we do not, at the moment, think we should make any adjustments for this.
- when we reviewed the supply chain operations' renewals, we found that the increase in costs reflects an increase in wheeled plant expenditure in CP6, which is inherently 'lumpy'. In some cases, Network Rail is operating some items of wheeled plant, which are older than their normal asset life. We have reviewed these costs and Network Rail has adequately explained them.
- our review of the efficiencies and headwinds found that the supply chain operations team had not clearly quantified the efficiencies and headwinds.
- we recognise, given the scope of change anticipated, supply chain operations is at an early stage in the development of its efficiency programmes.
- we reviewed the £57m headwinds in supply chain operations and found that they are poorly justified, e.g. issues with the supply chain are mentioned but there is no robust explanation of why those issues would cause a cost increase and why they could not be mitigated. We think £23m of these headwinds should be included in the pre-efficient baseline (£13m for rental costs following the sale of an asset in CP5 and £10m for a deferral of wheeled plant purchases from CP5 to CP6). We used these findings to support the efficiency challenge, which

we set for Network Rail in the draft determination (see chapter seven). Network Rail's response is discussed in our conclusions below.

For Contracts and Procurement:

- our engagement with contracts and procurement included both dedicated deep dives, and a meeting with Network Rail's consultants, PwC. PwC reviewed Network Rail's procurement function's effectiveness, and compared it with best practice. It covered strategic procurement issues for both goods and services bought for route services and the goods and services that route services buys on behalf of the routes.
- PwC found that, generally, Network Rail is a considerable distance from the 'frontier' of an efficient and effective procurement function, e.g. for planning what it needs to buy. Our review of Network Rail's strategic plan did not identify a credible plan to address this. However, the study did not quantify its findings. It is also not clear how much of Network Rail's efficiencies are linked to procurement across the whole business.
- given this lack of clarity and the importance of procurement to Network Rail's efficiency we note that in PR13, we procured a study[56], which identified that if Network Rail's supply chain management was effective and efficient, the business would be able to save between £90 and £530m per year, with a mid-point estimate of £310m per year.
- clearly, this study is six years old but given the efficiency issues Network Rail has had in CP5 and the unquantified findings of PwC, which highlighted a large gap to best practice and that contracts and procurement rail buys circa £1bn pa of good and services. It could be the case that there are still substantial savings to be made in this area. However, because we have accepted Network Rail's proposal as the basis for the final determination, we have not considered this issue further.

5.75. The table below summarises headwinds in the route services directorate that we considered were poorly justified and we have identified an additional tailwind.

[56] *Review of Network Rail's Supply Chain Management*, civity Management Consultants GmbH & Co KG, May 2012. This may be accessed here.

Table 5.21 - Summary of our findings for Route Services Directorate headwinds and tailwinds

Headwind	Value - £m CP6 (whole control period)
Information Technology - headwinds	3
Information Technology - tailwinds	16
Supply Chain Operations	57
Total headwinds and tailwinds	**£76m**

Safety Technical & Engineering

Table 5.22 - STE support costs

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient baseline	100	46	46	42	42	276	47	48	50	50	51	246
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0	0	0	1
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	(6)	(7)	(7)	(8)	(8)	(36)
Post-efficient cost	**100**	**46**	**46**	**42**	**42**	**276**	**41**	**41**	**42**	**43**	**43**	**211**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

Table 5.23 - STE renewals costs

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient baseline	30	24	37	109	157	356	227	304	331	223	163	1,248
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	(4)	(8)	(13)	(15)	(15)	(55)
Post-efficient cost	**30**	**24**	**37**	**109**	**157**	**356**	**223**	**296**	**318**	**208**	**148**	**1,193**
Source: Network Rail SBP consolidated Renewals databook, 2017-18 prices, post-efficient												

Table 5.24 - STE industry costs and rates

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient baseline	100	46	51	44	42	283	455	495	514	527	548	2,540
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	-	-	-	-	-	-
Post-efficient cost	**100**	**46**	**51**	**44**	**42**	**283**	**455**	**495**	**514**	**527**	**548**	**2,540**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

5.76. STE's primary role is to support the routes with technical leadership whilst keeping passengers, the public and the workforce safe. Its plan included the costs of its four key functional areas: research and development, engineering and asset management, Quality Health Safety & Environment (QHS&E) and security and information management. STE support costs are based on proposed headcount. We challenged its planned staffing numbers for CP6 along with its proposed contractual relationship with partnering organisations which will provide additional resources to deal with short term peaks in demand. We are satisfied that STE resources would be available to meet its assurance function role and to act as an enabler for the routes to meet their business objectives and continuously improve cost, efficiency and performance. Network Rails STE strategic plan includes a 15% efficiency for CP6 support costs.

5.77. Renewals costs encompass the following network wide programmes: £167m for asset management excellence, £59m for cyber security and technology, £190m for intelligent infrastructure (including remote monitoring), £74m for work force safety and health and well-being activities, £263m for faster Isolations and £440m for an industry-wide research and development fund. Further breakdowns against each of these areas was provided for our review. STE strategic plan includes a 4.4% efficiency for CP6 renewals expenditure.

5.78. The £2,540m of STE Industry Costs and Rates include £2,480m of traction electricity[57] costs together with £57m of RSSB membership costs and £3m of BTP costs.

[57] These costs are the costs of purchasing electricity for operators. They are referred to as traction electricity costs or EC4T. The costs are included within the STE business unit but they are passed on to operators, so no efficiencies or headwinds are applied to them. These costs are discussed in more detail below.

Benchmarking activity

5.79. In May 2017, management consultants civity were commissioned by STE to undertake a review of its benchmarking processes. Benchmarking is one of STE's key processes for supporting the delivery of its accountabilities, enabling Network Rail to learn from and adopt good practices evident in other national railways, other asset intensive organisations and other sectors. The report made the following key findings:

- benchmarking is a core accountability of STE and therefore there is a general responsibility across STE for benchmarking, however, there is no defined overall responsibility nor any formal competence centre. In addition, central coordination of benchmarking activities does not exist, thereby missing potential benefits and efficiencies;
- whilst there is a strong commitment to benchmarking in the STE leadership team, demonstrated by its prominence in its strategic plan, benchmarking activities receive a low prioritisation and suffer a lack of resources to deliver them to a high quality in a timely way.
- certain teams generate and are responsible for benchmarking activities (e.g. advanced analytics, maintenance). However, these functions have no formal responsibility for benchmarking more widely. Overall there is an absence of a process for prioritising benchmarking activities; and
- there is poor knowledge management, with a very limited SharePoint site containing some information, and no clear process for creating benchmarking reports or disseminating findings.

5.80. The report contained twelve recommendations as to how STE could achieve greater effectiveness and efficiency of its benchmarking activities along with an overriding recommendation to build on the momentum and current level of engagement achieved through the benchmarking programme to implement and embed the recommendations during the final year of CP5 into CP6. These have not affected our assessment but we will engage with Network Rail further through our ongoing monitoring activity.

Traction electricity costs

Table 5.25 - Traction electricity costs by route[58]

£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	CP5 Total	2019-20	2020-21	2021-22	2022-23	2023-24	CP6 Total
Anglia	46	45	44	47	49	**232**	60	68	68	69	70	**335**
LNE & EM	46	45	44	49	63	**247**	64	76	93	101	118	**452**
LNW	66	68	68	76	79	**357**	94	100	101	103	104	**502**
South East	79	79	77	81	84	**400**	110	116	116	117	118	**577**
Wales	0	0	0	1	3	**4**	1	1	1	1	1	**4**
Wessex	43	43	42	44	45	**217**	60	62	62	63	63	**310**
Western	2	1	3	15	34	**56**	24	27	27	27	27	**131**
Scotland	19	21	21	22	23	**106**	32	34	34	34	35	**168**
Total	**301**	**303**	**299**	**336**	**380**	**1,619**	**443**	**483**	**502**	**515**	**536**	**2,480**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

5.81. Traction electricity (EC4T) is procured by Network Rail on behalf of train operators. After deducting the cost of Network Rail's own use of electricity (for example, for its own trains), these costs are passed through to operators through the EC4T charge that is included in income. These costs (£2,480m) are included in Table 5.2 in STE industry costs and rates together with £57m of RSSB and membership costs and £3m of BTP costs.

5.82. Network Rail's total forecast EC4T costs for CP6 is £2,480m, which is £861m higher than in CP5 (in 2017-18 prices). This increase is due to a combination of increased electricity usage and an increase in the price of electricity.

5.83. Our review of EC4T costs included assessing the underlying factors that are driving the increased cost for Network Rail in CP6, contractual agreements that are in place for EC4T, the purchasing strategy and how forecast electricity losses are treated. The following paragraphs consider each of these factors.

Cost drivers

5.84. The amount of electricity used and the cost of the electricity are the two drivers of traction electricity costs. Network Rail's forecast volume and price changes for traction electricity are displayed in the table below.

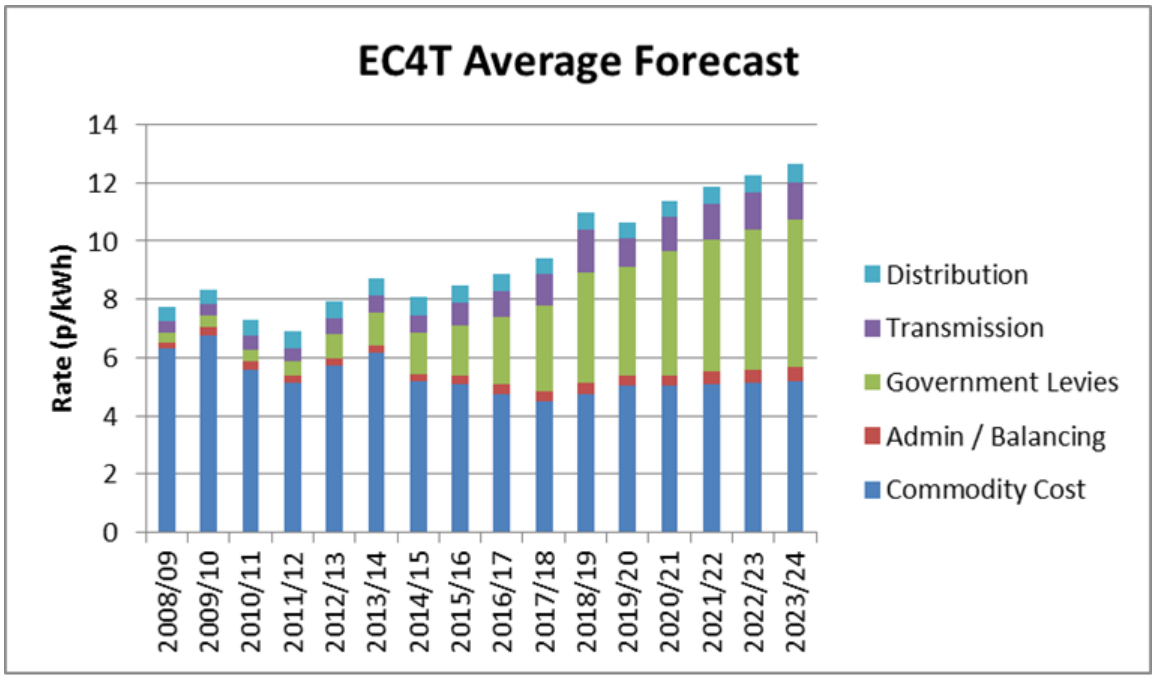
[58] Passenger Traction Electricity costs have been allocated across the routes based on electric vehicle miles. Freight Traction Electricity costs have been allocated based on electrified KGTM.

Table 5.26 - Summary of key drivers of EC4T costs

	2019-20	2020-21	2021-22	2020-23	2023-24	Total change since start of CP6
Rate change (%)	2.1	3.8	0.1	0.9	0.9	7.8
Consumption change (%)	10.5	5.1	3.7	1.6	3.3	24.2
Total change (%)	**12.8**	**9.1**	**3.8**	**2.5**	**4.2**	**32.4**

5.85. The volumes are forecast based on input from the routes and train operators. The figure below shows the forecast electricity rates for CP6 compared to CP5. These are average rates across the routes. Most cost elements are similar to the CP5 levels with the exception of UK Government levies, which are the main drivers of the forecast rate increases in CP6.

Figure 5.1 - EC4T average forecast rates (p/KWh)



Source: Network Rail Traction Electricity Costs forecasts September 2018, 2017-18 prices, post-efficient

5.86. The average forecast rate has three main elements:

- distribution/transmission costs – the costs of delivering the electricity, these costs are largely fixed;
- UK Government levies (45 to 55% of the total cost) – these include the feed in tariff, renewables obligation, contract for differences and the capacity mechanism; and
- commodity costs.

5.87. Commodity costs are volatile in nature and as a result are difficult to predict. Movements in the electricity market has the potential to materially change the forecasts that Network Rail has provided.

5.88. Delivery costs (distribution and transmission) are location specific in terms of price (these only represent a small amount of the rates). All other rates are not location specific.

Contractual agreements

5.89. Network Rail currently has a ten-year flexible contract with EDF Energy for provision of electricity. This flexible contract commenced in October 2014 after consultation with train operators. The only cost element that is fixed is the management fee. These costs accounts for less than 1% of the total cost.

5.90. Commodity costs can be fixed for future periods of time and the forecast takes account of those agreements.

Purchasing strategy

5.91. Responsibility for when to fix prices is devolved to train operators at their request. Most operators have formed a buying club (through the RDG) to get the best value for money and gain economies of scale. Operators' membership of the buying club is voluntary. Operators are able to cease membership. As a result of the train operators' ability to fix commodity prices there is potential for different rates between different routes and across England& Wales, and Scotland.

Losses

5.92. Losses are identified based on the variance between expected and actual use. Actual losses are determined based on metered readings from trains. Expected use is based on assumed consumption for any given journey. There is a specific loss assumption for each route based on the combined loss.

Other operating income

Table 5.27 - Network Rail other operating income

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Total	**374**	**338**	**311**	**312**	**271**	**1,607**	**255**	**254**	**254**	**254**	**254**	**1,271**
Source: Network Rail other operating income paper, 2017-18 prices, post-efficient												

5.93. Other operating income ("OOI") is income that Network Rail receives for a range of activities not shown under other single till income (OSTI), e.g. sales of scrap. Some

of this income recovers costs that have been incurred by Network Rail (for example, costs incurred for undertaking work for third parties[59]) and also there are some one-off items.

5.94. OOI is categorised as a credit/negative cost in operating costs in Network Rail's strategic plans and SBPs (i.e. a reduction in operating costs) and is spread across the other numbers in this document. For example, the finance business unit will have some OOI included in operating costs[60].

5.95. Other operating income is forecast to be £1,271m in CP6, which is 21% less than in CP5 (£1,607m). Network Rail has said it has assumed a flat profile for this income because it is inherently difficult to forecast the one-off items (such as work carried out on behalf of third parties).

5.96. The £380m variance between CP5 and CP6 is explained in the following table.

Table 5.28 - Other operating income: CP5 to CP6 variance

Category	£m 2017-18 prices	Notes
One-off items in CP5	167	One offs in CP5 (such as work on third party assets, favourable commercial settlements etc.)
Non continuation of Thameslink resilience fund	74	In CP5, DfT funded improvement works[61]
Reduction in telecoms leasing income and asset sales	39	Less lease income in CP6 and no asset sales in CP6
Lower managed station toilet income	10	Network Rail is no longer charging for the use of managed station toilets in CP6
Recovery of secondment costs	8	Network Rail is assuming a lower level of secondments in CP6
Reduction in utilities recoveries	5	A change to the billing system in LNW will lead to a decline in utility recoveries (moving to a metered system from an estimate based one)
Accounting changes	6	The Scotland route changed the way it accounted for asset protection income in CP5. Instead of accounting for income upon the closure of a project, it now accounts for income when the expenditure it relates to occurs. The impact of this timing difference was an increase of £6m of income in CP5, which is not repeated in CP6

[59] Further examples include the costs related to the provision of services to NRHS that it then recovers from HS1; income from car parks, left luggage and telecom masts; damage cost recovery (e.g. damage to bridges); freight connection charges; and the recovery of the cost of staff seconded to external companies.
[60] This means that if gross operating costs were £10m and other operating income £1m then the plan would show £9m net operating costs (£10m expenditure less £1m of income).
[61] More information is available here https://www.networkrail.co.uk/feeds/major-funding-improvements/.

Category	£m 2017-18 prices	Notes
Property sub-lease	3	In CP5, the Scotland route was receiving income from sub-leasing part of its St Vincent Street property to its alliance partner Abellio ScotRail. Abellio ScotRail has now vacated the property. Network Rail has assumed that it will not be able to lease this property in CP6
Other factors	68	
Total	**380**	

5.97. In spring 2018, we asked Network Rail to identify its forecast other operating income and justify its assumptions. During the summer of 2018, Network Rail conducted an exercise to assess the forecasts in its route plans.

5.98. The analysis it provided for us is summarised in the above table. The main issue it identified in late August 2018, was that the Scotland route SBP incorrectly included toilet charge income at managed stations in its plan, As Network Rail will stop charging for toilets at its managed stations[62] in 2019, we have adjusted for this issue in our final determination. Therefore, net operating costs in Scotland and Great Britain have increased by £2.5m.

5.99. The analysis Network Rail provided in late August 2018 showed a £380m reduction compared to CP5. The large majority of the changes Network Rail identified were reductions in income. We think that this is unrealistic.

Route-incurred Support costs

Table 5.29 - Route-incurred support costs (included in geographic route strategic plans)

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Actual / pre-efficient baseline	38	50	44	55	48	235	73	73	73	73	73	367
Plus: Headwinds	n/a	n/a	n/a	n/a	n/a	n/a	3	3	3	3	3	16
Less: Efficiencies	n/a	n/a	n/a	n/a	n/a	n/a	(1)	(2)	(2)	(2)	(3)	(10)
Post-efficient cost	**38**	**50**	**44**	**55**	**48**	**235**	**75**	**75**	**75**	**74**	**74**	**372**

[62] These are predominantly the major stations on the network that Network Rail directly manages. Other stations are managed by the local train operating companies.

	CP5						CP6					
£m, 2017-18 prices	2014-15	2015-16	2016-17	2017-18	2018-19	Total CP5	2019-20	2020-21	2021-22	2022-23	2023-24	Total CP6
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient												

Table 5.30 - Route-incurred support costs (by Route)

£m, 2017-18 prices Route	Staff costs	Plant and Machinery	Work place management	Training	Total
Anglia	7	-	20	-	27
LNE&EM	50	1	48	-	100
LNW	18	0	42	1	60
Scotland	49	-	-	7	56
South East	39	2	24	-	64
Wales	4	0	-	0	4
Wessex	36	-	-	7	43
Western	18	-	-	-	18
Total	**221**	**3**	**134**	**15**	**372**
Source: Network Rail SBP consolidated Opex databook, 2017-18 prices, post-efficient					

5.100. Network Rail's geographic routes incur support costs for a range of ancillary business activities, some of which have been transferred from the centre. These include staff costs for route finance, human resources, route contracts and procurement teams, as well as some premises costs.

5.101. In Table 5.30, we break down route-incurred support costs to show the split between staff, plant and machinery, work place management and training.

5.102. Our review of route-incurred support costs found that routes had classified £134m of workplace management costs for CP6 in total as support costs, while others had classified these costs as operations expenditure. After adjusting for this issue (see table below), the route-incurred costs in CP6 are forecast to be £238m, which is higher than the £192m incurred in CP5[63].

5.103. It is important for transparency and benchmarking that routes classify the same costs the same way. To ensure that we are able to effectively hold routes to account in CP6, we will treat these costs as being operations expenditure. We have also adjusted for this issue in the calculation of Network Rail's revenue requirements as shown in the financial framework supplementary document. This has no net impact on Network Rail's funding in CP6.

5.104. Our review of route-incurred support costs noted that many of these costs were incurred by routes during CP5 as a consequence of route-level devolution.

[63] Note: The costs in the first year of CP5 were £10m below the normal level.

However, Network Rail has not identified any corresponding reductions in the costs for CP5 in central functions.

5.105. Given these costs were in the scope of the Nichols report on headwinds and tailwinds, we did not analyse these headwinds and tailwinds from a bottom up perspective.

Table 5.31 - ORR re-allocation of Network Rail route-incurred support costs (included in geographic route RSPs)

	CP6					
£m, 2017-18 prices	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**Total**
SBPs	75	75	75	74	74	372
Re-allocation	(27)	(27)	(27)	(27)	(26)	(134)
ORR draft determination	**48**	**48**	**48**	**47**	**48**	**238**

Allocation of Support and Central function costs to routes

5.106. The expenditure incurred in Network Rail's central functions needs to be allocated to routes, for the purposes of determining route-level and national settlements.

5.107. The central costs that have been allocated to Scotland are forecast by Network Rail in its SBP to rise from circa £700m in CP5 to circa £1,000m in CP6, an increase of circa £300m. This is summarised in Table 5.32 . The table shows the increase in central costs largely by business unit[64].

Table 5.32 - Analysis of the increase in central costs allocated to Scotland in Network Rail's SBP

£m, 2017-18 prices	**CP5**	**CP6**	**Difference**
Pass through costs	300	357	57
Route services	139	166	27
STE	56	139	83
Telecoms	86	111	25
Group	19	47	28
System Operator	12	37	25
Other	127	137	10
Total	**739**	**994**	**255**
Source: Network Rail analysis, 2017-18 prices, post efficient numbers			

5.108. We have identified below the reasons for the differences in central costs between CP5 and CP6, by the type of reason not the business unit (some of the numbers are

[64] Except for pass through costs, where it is more transparent to show the cost type, instead of the business unit that is responsible for the cost.

estimates). Where possible we have noted the business unit that is responsible for the cost. To understand these costs, it is worth noting that:

- around £60m of the increase is traction electricity costs, largely due to increased electrification and electricity price increases - this is a 'pass through' cost, which Network Rail has little control over; and
- around £24m is a technical adjustment as property capital spending has been reclassified from enhancements to renewals (i.e. renewals is higher but enhancements lower). As the HLOS has not specified enhancements, this appears to increase central costs.

5.109. The remaining cost increase includes these main categories:

- higher volumes in CP6 due to the timing of renewal of certain centrally-held assets (£80m). This includes telecoms (£60m) and wheeled plant renewals (£20m);
- higher spend by the central STE directorate on capital programmes (£40m) including measures to improve productivity of work on electrified lines;
- Scotland's share of the R&D fund (£46m);
- additional SO costs (£25m) to improve its capability, and to support additional investment in better timetabling systems; and
- other cost increases which in turn are offset by Network Rail's view of efficiency on central costs (£45m).

5.110. Network Rail proposed an approach to allocating central costs to routes as part of its SBPs. To support our work reviewing this approach, we asked CEPA to advise us on Network Rail's approach to cost allocation[65].

5.111. CEPA noted that Network Rail's approach is free of material issues, however, it identified six recommendations for Network Rail in CP6:

- introduce a greater level of challenge, including external challenge, into the process of assigning drivers to cost categories and develop dialogue between central and route finance teams in this area;
- make consideration of alternative drivers a more explicit part of the cost allocation review process;
- ensure that the next version of its cost allocation handbook addresses transparency, and more thoroughly document, not just the final proposed cost allocations, but all steps of the process leading to those allocations;

[65] *Report on Network Rail central cost allocations*, Cambridge Economic Policy Associates Ltd, April 2018. This may be accessed here.

- broaden the principles that it uses to allocate costs. Instead of just using a cost-based methodology it should also consider using a value based methodology for some issues;
- consider adding cost materiality to its existing principles, and focus efforts to improve cost allocations on the larger cost categories; and
- review the balance between cost causality and value/benefit considerations in cost allocations.

5.112. CEPA said that it thought that Network Rail's allocation of central costs to Scotland uses well-established methods. However, given the importance of the methodology for allocating central costs to routes to the route settlements and the large increase in the costs being allocated to Scotland. Following our draft determination, we had some detailed discussions with Network Rail, DfT and TS on the allocation of costs to routes, with a particular focus on Scotland.

5.113. These discussions focused on both the quantum of central costs and the methodology for allocating them to routes. Overall, we thought Network Rail had taken a reasonable approach to the allocation of central costs across routes in its SBPs but we expect it to keep the methods it uses under review in CP6 and where appropriate update its methodology. In the discussions, Network Rail identified some areas where the method it uses to allocate costs may change if appropriate data was available that would allow the use of a different method

5.114. As a result of these discussions, we have made no changes to the allocation of central costs to the routes, apart from where we have made a change to the Great Britain cost level that is then allocated to the routes. For example, research and development expenditure, where in our final determination we have decided that the funding should be reduced, which reduces the allocation to Scotland to £26m (rather than £46m).

Financial risk

5.115. In addition to scrutinising Network Rail's spot estimates for its expenditure in each year of CP6, we have assessed Network Rail's risk ranges for support and central functions.

5.116. The expenditure numbers shown in the tables in this section do not include provisions for financial risk. In CP6, risk in support and central function costs will be managed through the centrally controlled group portfolio fund as explained in the supplementary document – Financial Framework.

Infrastructure Projects (IP) costs

5.117. The costs of the IP function are not shown separately in the RSPs. Rather, they are included in the costs of renewals and other Capex items managed by IP.

5.118. IP costs have been built into the unit rates that routes used to develop their Strategic Plans. The IP cost has been calculated as six-percent of the total unit rate. IP have used a planning assumption of one person being required for each £1.5m of investment to calculate its expected headcount rather than a bottom up plan. We regard this as a reasonable basis for estimating costs bearing in mind that routes are free to source renewals from other suppliers if they are able to secure better value.

5.119. During our review, we held several meetings with IP. This included a meeting in which the IP leadership team presented its approach to improving its safety performance, improvements to the monitoring of newly installed assets, and a high-level strategy for procurement in CP6. We had further meetings to understand the assumptions that it is making on the volume and scale of enhancements that it expect the governments to commit to in CP6 so it can size the organisation to deliver efficiently, and its plan if these assumptions prove to be incorrect.

5.120. In CP6, we expect the routes to hold their delivery agents including IP to account for efficient delivery.

Conclusions

5.121. Overall, our review of pre-efficient costs and efficiencies in support and central functions costs identified that many of the headwinds appear to be incorrect or poorly justified.

5.122. We summarise below the findings of our bottom-up review of Network Rail's Support and Central functions costs. In total, this identified £78m of costs that we consider Network Rail included in addition to the efficient cost of delivering the outputs of the HLOS.

5.123. The £78m arises because our view is that Network Rail did not justify its forecast inefficiencies and headwinds (£76m) and excluded some tailwinds (£21m). In total this is £97m (as shown in Table 5.33). This is offset by issues with pre-efficient expenditure of £19m as described above.

Table 5.33 - Support and central function costs – summary of our bottom up assessment of headwinds and tailwinds

Headwinds/tailwinds (£m, 2017-18 prices)	Value - CP6 Headwinds	Value - CP6 Tailwinds	Value - CP6 Total
Communications	(10)	(0)	(10)
Legal and Corporate Services	(1)	(0)	(1)
Asset Information Services	(5)	(5)	(10)
Route Services Directorate	(60)	(16)	(76)
Total value of poorly justified/incorrect headwinds and excluded tailwinds	**(76)**	**(21)**	**(97)**

Notes:

1. Negative figures indicate we think Network Rail's SBPs are too high.
2. If we had made these changes to forecast expenditure, we would have also adjusted pre-efficient expenditure by £19m. £23m of this is in route services and -£4m is in Legal and Corporate Services. The net reduction in expenditure would have been £78m (£97m less £19m).
3. Total value of draft determination headwinds adjustments reflecting the extrapolation of poorly justified/incorrect route headwinds from the Nichols work was £62m.

5.124. We used this finding to support the efficiency challenge, which we set for Network Rail in the draft determination. The challenge and Network Rail's overall response are described in chapter seven.

5.125. Within its response, Network Rail proposed £86m of additional efficiencies in central functions (£56m capex, £30m opex). This proposal was supported by detailed analysis. We have accepted this proposal as the basis for our final determination and we will make corresponding adjustments to Network Rail's SBPs in our financial models.

Significant changes since draft determination

No.	Subject	Affected paragraphs
1	Basis of efficiency challenge and Network Rail's response updated.	5.14, 5.22, 5.38, 5.59, □, 5.121 - 5.125
2	Off-charges	5.41
3	Insurance section updated	5.42 - 5.54
4	Electricity for traction section added	5.81 - 5.92
5	Other operating income section added	5.93 – 5.99
6	Allocation of central charges section revised	5.106 - 5.120
7	Conclusions updated	5.121 - 5.125

6. Digital Railway programme in the SBPs

Assessment Criteria

6.1. The following question framed the assessment of this area:

- Which (if any) elements of the digital railway programme should be funded within the PR18 settlement?

Findings

Overview

6.2. Network Rail is discussing the funding of the majority of its digital railway programme with DfT separately to the PR18 process, so the costs are outside the scope of this review. However, the strategic plans and consolidated SBP databooks included three types of expenditure relating to digital railway programme, each with different implications on our review:

- digital railway programme enhancements;
- conventional signalling schemes in areas where digital railway programme schemes are being planned; and
- other digital railway programme related costs.

Digital railway enhancements

6.3. £1,184m of expenditure was included in the SBP consolidated databooks for digital railway programme schemes but Network Rail has excluded these from expenditure totals for comparison to the operations, maintenance, renewals and support portion of DfT's SoFA (none of these schemes are in Scotland). The relevant schemes are presented in Table 6.1.

Table 6.1 - Digital Railway programme enhancements in the SBP databooks

Scope	Post-efficient cost £m
Traffic Management (TM) and European Train Control System (ETCS) on East Coast Main Line (LNE&EM). This is expected to include removal of lineside signalling South of Peterborough and replacement with in-cab ETCS systems.	378
TM in the South East route. This will introduce a TM overlay across the whole route, to improve central monitoring and control of trains.	210
ETCS/TM on Great Eastern Main Line (Anglia). The majority of lineside removals are planned between Chelmsford and Stratford.	221

Scope	Post-efficient cost £m
ETCS/TM on South Western Main Line (Wessex). The majority of lineside removals are planned between Richmond and Wokingham.	107
Cab fitment for passenger and freight trains (FNPO)	268
Total (capital expenditure)	**1,184**
Source: Network Rail, 2017-18 prices	

6.4. Network Rail has stated that these schemes will be funded as enhancements by DfT (if it agrees), or from alternative sources of funding, e.g. from the National Productivity Investment Fund (NPIF).

Conventional signalling schemes to be considered for digital technology

6.5. There are three locations where signalling renewals are needed in CP6 and where a conventional scheme has been included in Network Rail's base plan. Network Rail has stated that it intends to incorporate digital rail technology subject to funding being secured. This will change the scope of work. These schemes are presented in Table 6.2.

Table 6.2 - Conventional signalling, considered for digital railway programme schemes

Scope	Post-efficient cost £m
Signalling renewals at Crewe (LNW)	270
Signalling renewals at Feltham (Wessex)	177
Signalling renewals on the East Coast Main Line (LNE&EM)	194
Total (capital expenditure)	**641**
Source: Network Rail, 2017-18 prices	

6.6. We have confirmed the requirement for these schemes as part of our review of the CP6 signalling renewals plans. Therefore, they have been included in the final determination on the basis that conventional signalling renewals are required even if the digital rail element does not proceed. In the event that Network Rail is able to progress a digital signalling solution at these locations, this funding would form a contribution to the total cost, subject to any additional cost being funded through the digital railway programme. As stated above, the programme is being discussed between Network Rail and DfT outside the PR18 process.

6.7. We expect Network Rail to continue to explore options to drive down unit costs for signalling (both conventional and digital) and so increase the volume of schemes which can be undertaken. We recognise that, over time, reductions in the cost of digital rail technology may mean that this becomes more attractive than conventional renewals. This said, we recognise that signalling schemes often have long lead times and that the scope for any such change may be limited in CP6.

Other Digital Railway programme related costs

6.8. In addition to the costs noted above, which relate to the geographic routes, the SBPs also included amounts for digital railway related renewals and operational expenditure in Network Rail's central functions. These costs fall into two groups and are presented in Table 6.3 and Table 6.4.

Table 6.3 - Digital railway programme costs (capex) in the route services function

Scope	Post-efficient cost £m
Fitment of ETCS to 36 on-track machines (OTM) (18 first in class + 18 fleet) for maintenance on East Coast Main Line South	76
Installation management for 4 Train Operators	8
Project management including procurement and legal	3
OTM training costs for drivers, operators and maintainers, including simulators	5
Training activities including training centres for signallers and traffic management, and whole life cost for support to LNE&EM route	25
IT requirements to integrate new signalling via Network Rail telecoms and Route Services IT systems	2
Total (capital expenditure)	**119**
Source: Network Rail, 2017-18 prices	

Table 6.4 - Digital railway programme costs in the group digital railway function

Scope	Post-efficient cost £m
Industry programme activities including Project Management Office (PMO), business case and strategy support, technical assurance	84
Digital Railway System Authority including 'Guiding mind', system requirements and integration, product development, joint development group	7
National Enabling Projects including test facilities (ERTMS National Integration Facility (ENIF), Rail Innovation and Development Centres (RIDC), System Integration Lab), telecoms upgrades, core GSM-R network and on line key management	69
TM including Maintenance and support for TM systems already deployed in CP5 in Anglia and Wales	20
Total (£128m capital expenditure and £52m operational expenditure)	**180**
Source: Network Rail, 2017-18 prices	

6.9. DfT has confirmed that the OSMR portion of the SoFA funding can be used to pay for its share of the costs in Table 6.3 and Table 6.4 (£119m + £180m). We have reviewed these costs and requested further clarification from Network Rail, in particular on the scope and geographic location of works, which was not clear in Network Rail's SBPs. Following consideration of detailed responses, we are satisfied that these costs are efficient and they have been included in our determination.

Digital Railway costs in Scotland

6.10. As part of our review of the digital railway programme costs, further clarification was sought from Network Rail as to how these costs have been allocated to the Scotland route in the SBPs. Network Rail's allocation to Scotland is summarised in Table 6.5.

Table 6.5 - Allocation of digital railway costs in Scotland

Item	GB total (Post-efficient) £m	Scotland allocation (Post-efficient) £m
OTM fitment (Route Services, Capex)	119	-
Digital Railway programme team (Capex)	128	17
Digital Railway programme team (Opex)	52	5
Total	**299**	**22**
Source: Network Rail, 2017-18 prices		

Responses to the draft determination

6.11. We note the concerns raised by respondents to our consultation on the draft determination about confidence in the deliverability of large-scale digital signalling schemes. Whilst this is perhaps more relevant to the enhancements programme, we expect Network Rail to assure the delivery of essential CP6 signalling volumes as part of any consideration of digital alternatives.

6.12. DfT has confirmed prior to the draft determination that it supports the England & Wales share of the GB digital railway programme spend being included in Network Rail's costs. In discussions with Transport Scotland, it has consistently rejected proposals that it should fund the GB programme team as digital rail is not a requirement in the Scottish HLOS. It wants to be able to decide what funds are made available for digital rail (and when) from the remaining SoFA funding.

6.13. In its response to the draft determination, Transport Scotland indicated that it may be willing to contribute towards the digital railway programme subject to there being a digital railway strategy in place for Scotland. This is because Transport Scotland has confirmed it is not confident that the proposed Scotland route signaling strategy for CP6 adequately reflects Scottish strategic priorities.

6.14. Transport Scotland is also of the view that the work of the digital railway programme board does not consider the position in Scotland in enough granular detail, it considers that there is currently a greater focus on DfT's priorities.

Our assessment of responses to the draft determination

6.15. The GB total costs set out in Table 6.5 cover a programme team and fitment costs for Network Rail's own machines. Network Rail has said that operationally it needs the full programme team covered by its budget and it cannot scale this down to just England & Wales. Network Rail's plans do not include deployment in Scotland in CP6.

6.16. We know that the Scottish Ministers support innovation and electronic signalling solutions. In its Rail Infrastructure Strategy consultation[66] (which sought views to help inform its approach to specifying and funding for its priorities for the railway infrastructure from 2019 onwards), Transport Scotland set out that the Scottish Government is keen to support industry innovation, to improve the efficiency, resilience and quality of passenger-facing services. It committed to working with industry partners across Great Britain to support the development of proposals for a modernised railway, including the introduction of new electronic signalling solutions.

[66] *Consultation on Scotland's Rail Infrastructure Strategy from 2019*, Transport Scotland, 2016. This can be accessed here.

Conclusions

General conclusions

6.17. We reviewed the evidence submitted to support the items set out in Table 6.2, Table 6.3 and Table 6.4 so as to establish greater clarity about what the expenditure relates to. Based on this, we have decided that they are justified to be included in the final determination.

Digital rail costs for Scotland

6.18. We consider that the development of the digital railway programme will deliver future benefits for passengers in Scotland, that align with Scottish Government key strategic outcomes, in particular for improved services (digital rail technology will deliver faster journey times) and improved capacity.

6.19. Our view is that part of the cost of the GB-wide digital railway programme team should be allocated to Scotland, to support the long-term integrity of the rail network and reflecting that there is a reasonable prospect that benefits will be enjoyed by passengers and freight in Scotland.

6.20. Network Rail is in the process of developing a GB wide strategy for digital train control from CP6 onwards. This will be a renewals based long term plan that links together infrastructure and train investments. To address Transport Scotland's concerns on the Scotland routes signalling strategy, Network Rail is required to establish a separate strategy for Scotland (in addition to but feeding into the overall GB-wide strategy).

6.21. Throughout CP6, we also require Network Rail to provide a greater level of assurance to Transport Scotland that the priorities of the Scottish Ministers, are fully reflected in the digital signaling plans for Scotland. Transport Scotland must also be involved in the development of the Scottish strategy for digital train control.

6.22. This then leaves the issue of how this should be funded. Based on the SBPs, Transport Scotland's share of the GB programme team costs is £22m. We have given the issue of funding careful consideration. However as set out in the draft determination, we continue to be of the view that GB system is an integrated system and there are ultimately a number of costs that individual funders could say they do not benefit from and vice versa, but they do benefit from the whole system. There is a balance between meeting a funder's requirements and avoiding what could be seen by other funders as adversely affecting the integrity of the railway as a system. This is particularly the case if funders could change their mind in the future.

6.23. Our view is that part of the GB digital railway programme team (£22m) should be allocated to Scotland, as the rail network has to work as a GB system on a long term basis. We consider that the steps Network Rail is required to take during CP6,

including the development a Scottish strategy for digital train control and a greater level of assurance from the digital railway programme board, should provide Transport Scotland with confidence that Network Rail's plans for digital rail in Scotland are taking account of the priorities of the Scottish Ministers.

6.24. Following publication of the final determination we will work with Network Rail and Transport Scotland to ensure there are appropriate governance arrangements for the digital rail spend in CP6.

Ongoing development and monitoring of digital railway programme plans

6.25. While the majority of the digital railway programme costs fall outside the scope of PR18, we support Network Rail's strategy of replacing life expired conventional signalling with digital or 'digital ready' technology from CP6 onwards. We recognise that Network Rail will therefore continue to review its CP6 signalling plans following completion of PR18 as it continues to work with funders and stakeholders to develop the digital rail strategy. We require Network Rail to update ORR on changes to the planned signalling renewals consistent with our policy on managing change.

6.26. Because of the interaction between enhancement funding and renewals and consistent with the lessons learnt from CP5, for expenditure funded through the periodic review, we will engage with relevant parties to establish:

- clear ring-fencing of the SoFA funded digital rail related expenditure;
- clarity around the roles of governments and the ORR in respect of approving expenditure; and
- who is responsible for identifying an up-front estimate of the efficient costs of this work?

In addition, we will monitor the efficiency of this expenditure, relative to the forecasts made when projects were approved.

Significant changes since draft determination

No.	Subject	Affected paragraphs
1	CP6 volumes to be assured where digital schemes replace conventional signalling renewals.	6.4
2	Digital Railway programme costs in Scotland section updated to reflect responses to the draft determination consultation	6.7 - 6.17
3	Recognition that digital railway programme plans will continue to evolve and need for change control.	6.22 - 6.23

7. Route efficiency plans

Assessment criteria

7.1. Our review of efficiencies drew on the findings from an independent reporter mandate undertaken by Nichols[67] (Efficiencies Report). The purpose of that work was to provide assurance to ORR as to the reasonableness of the efficiency and headwind elements of the RSPs, and the framework within which they were produced. Nichols approached this assessment through the following questions:

- is the efficiency and headwind framework in which the routes have been asked to operate within a reasonable approach;
- has each route followed a reasonable process within the framework;
- are the plans produced by each route a reasonable outcome of the process undertaken; and
- have any factors been identified that merit further consideration, that might materially impact the route headwinds/efficiencies plans?

7.2. The independent reporter mandate included the headwinds and efficiencies contained in the eight geographic RSPs but excluded those in the plans for central business units. This sample accounts for 79% of Network Rail's net overall adjustment for headwinds and efficiencies.

Findings

7.3. The independent reporter's findings are summarised below and these generally apply to all routes although the impact of any consequential funding reallocations varies between routes.

7.4. Network Rail's approach to headwinds and efficiencies has been based on a concept described by a 'fishbone' diagram. This has the following features:

- the presence of factors which have driven increases and reductions in cost during CP5 is acknowledged;
- CP5 costs used as inputs to CP6 unit rates and the estimating process itself should take account of these factors to provide a common, adjusted basis for CP6 pre-efficient costs. Network Rail describes this as 'CP6 Core' pricing;
- the 'fishbone' diagram provides a framework for routes and other business units to assess factors which (a) may reduce costs in CP6 ('tailwinds' and

[67] *PR18 Review of Network Rail Efficiencies*, Nichols Group Ltd, 18 April 2018. This may be accessed here.

'efficiencies') and (b) may increase costs in CP6 ('headwinds' and 'inefficiencies'); and

- for simplicity, factors leading to cost reductions are generally referred to as 'efficiencies' and those leading to cost increases as 'headwinds'.

7.5. The reporter concluded that the framework was logical but complex for the routes to fully comply with. As a result, the outputs were heavily reliant on interpretation and judgement applied by the routes.

7.6. The reporter found that the routes largely followed a reasonable process in evaluating their planned efficiencies and anticipated headwinds.

7.7. The reporter concluded that well-structured plans had been developed for efficiencies but raised concerns over:

- the quantum of the base costs to which efficiencies were applied;
- the quantum of the efficiencies targets;
- the basis of allowances for headwinds; and
- a different estimating methodology applied by Anglia route (albeit that this did not appear to distort the post-efficient costs for this route).

7.8. In addition, the reporter found that headwinds in the SBPs have generally been estimated by routes using guidance provided by Network Rail's central functions but without applying the same level of challenge as for efficiencies.

7.9. The reporter raised concerns about a lack of transparency over whether adjustments for CP5 efficiencies, headwinds, one-off events associated with CP5 and price inflation to a 2017-18 base had been appropriately made to establish the 'CP6 core' level of pricing. These issues are considered in more detail in the cost planning section of chapter two.

7.10. The reporter also found that Network Rail had applied factoring to reduce estimated efficiencies so that they represented a more deliverable target. Whilst we recognise the importance of setting achievable targets, ORR considers that a one-way reduction in estimates may have indicated an overly cautious approach influenced by events in CP5 which may not be repeated in CP6.

7.11. The reporter found that the plans for headwinds could be categorised under a series of headings as shown in Table 7.1.

Table 7.1 - Headwinds categories identified by the independent reporter

Category	Description
A	Headwind meeting the fishbone framework criteria.
B	Headwind is already known and should have been included in the CP6 core plan, as an adjustment between CP5 exit and CP6 pre-efficient. Due to the lack of transparency of the CP6 core cost build-up there is a possible double counting for these headwinds.
C	Headwind which has an equivalent efficiency that has been factored down for delivery uncertainty/risk i.e. there is an overlap between the headwind and this factoring down of efficiency.
D	No mitigation or factoring down of headwind is apparent.
E	Is a risk that should already be covered by a combination of risk including in the unit price and the Portfolio Risk Allowance

7.12. Several of these categories point to areas where costs included in headwinds are potentially either double counted or misclassified.

Quantification of concerns about headwinds and efficiencies

7.13. The reporter's findings, read in conjunction with other relevant considerations, led us to conclude that it is highly likely that Network Rail's SBPs underestimated the level of net efficiency which it could make during CP6.

7.14. For our draft determination we therefore categorised the route headwinds in the SBPs using the categories in Table 7.1. We assumed that headwinds in categories B, C and E are likely to include double counting or misclassification so we applied factors to these categories so as to quantify the potential inefficiencies. The independent reporter also noted that headwinds had not been factored for reasonable mitigation, so we applied additional efficiencies for all categories.

7.15. The independent reporter's review did not cover central (non-route) headwinds and efficiencies. We reviewed the headwinds for central businesses in our review of support costs as described in chapter five. We concluded that double counting and misclassification for central headwinds were at least similar to the route headwinds so, for consistency, we applied the same factoring approach to these.

7.16. While the efficiency challenge was quantified based on a reduction to headwinds, we considered that our methodology meant that it could also be used as a proxy for potential inefficiencies across Network Rail's plans. Based on this approach, our draft determination set Network Rail a challenge to increase its net efficiency by £659m.

Network Rail's response to the draft determination

7.17. Following the draft determination, Network Rail commissioned Nichols to carry out a follow-up independent reporter study during July and August 2018[68]. The mandate

[68] *PR18 Review of Network Rail Efficiencies - Phase 2 (Headwinds)*, Nichols Group Ltd, 27 September 2018. This may be accessed here.

required the reporter to examine a sample of the largest headwind items and consider:

- compliance with the definition of headwinds;
- the likelihood of occurrence;
- the basis of valuation; and
- the possibility of duplication with other parts of the SBPs.

7.18. The reporter concluded that:

- The majority of headwinds were rated as 'amber' on a 'red / amber / green' scale, mainly due to a lack of evidence available to justify the headwinds or their valuation; and
- in terms of duplication between headwinds and costs in other parts of Network Rail's plans, the review did not find any clear evidence of double-counting. However, the review suggested a possibility of duplication for more than half of the headwinds.

7.19. After considering the follow-up report, we concluded that the study supported our position that a large proportion of Network Rail's headwinds were poorly justified or may be duplicating costs elsewhere in Network Rail's plans. Notwithstanding this, in its response to our draft determination, Network Rail rejected our approach of using an estimate based on headwinds as a proxy for inefficiencies elsewhere in its plans.

7.20. In our CP6 strategic business planning guidance to Network Rail we said that it was important that the company set out its assessment of the drivers for greater and reduced efficiency during CP5. In particular, we wanted to understand its view in respect of known areas of weaker than expected performance, and to explain how the plans for CP6 build on successes and address identified weaknesses[69]. We do not consider that the SBPs adequately explained these factors.

7.21. However, in overall terms, Network Rail's response to our efficiency challenge has been positive and it has accepted our conclusion that net efficiencies should be increased significantly.

7.22. Our efficiency challenge was £659m, Network Rail have proposed an additional efficiency of £671m based on the following items:

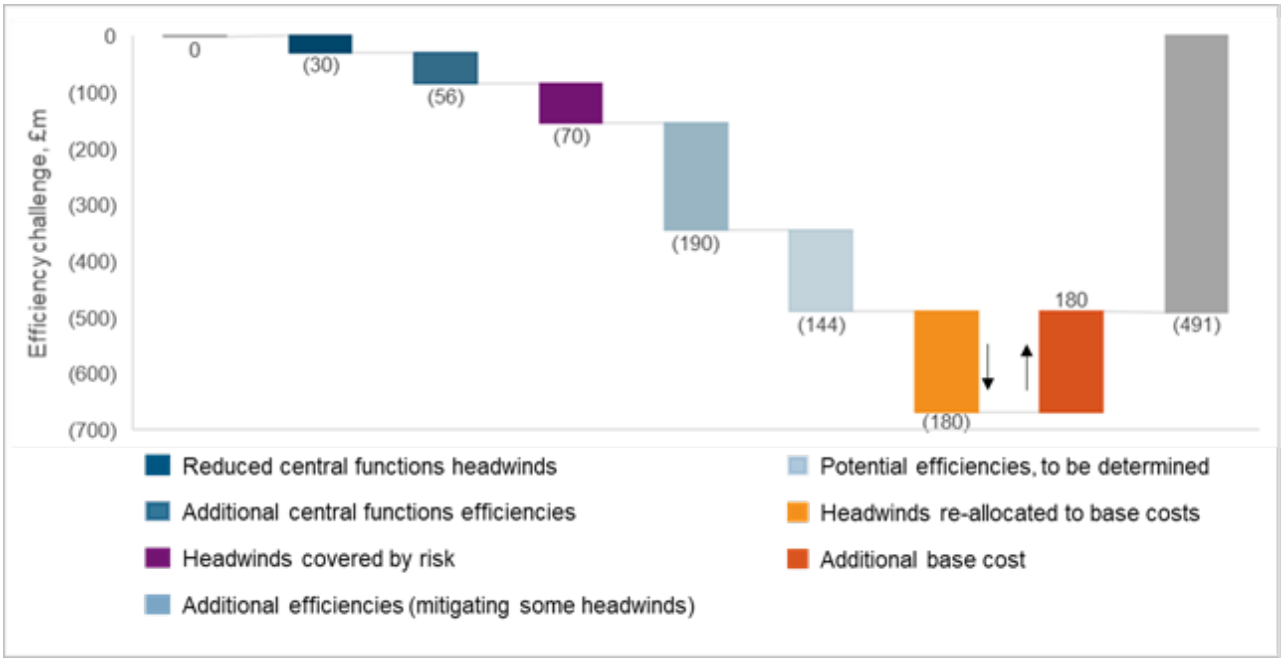
- £101m reduction in headwinds (£30m removed from central functions' support costs; £71m removed from central renewals costs allocated to the routes, because they are covered by route risk allowances);

[69] *Guidance on Network Rail's strategic business plans*, ORR, February 2017. This may be accessed here.

- £56m of additional efficiencies in central functions. The total efficiency improvement in central functions is £86m, including £30m reduced headwinds noted above;
- £190m of additional efficiencies for renewals in the routes. The routes determined the value of these efficiencies and have started developing detailed plans;
- £144m of further efficiency stretch for renewals in the routes. These do not have efficiency plans as yet, however the routes have all taken ownership of this additional efficiency challenge; and
- £180m of headwinds which should be re-allocated from headwinds to base costs. The £180m reduction in headwinds is cancelled out by a £180m increase in base costs so this has no net effect on funding but it still increases net efficiency by £180m.

7.23. Network Rail's proposal is compared with our efficiency challenge in Figure 7.1. This illustrates how the proposal releases £491m to support additional work activities.

Figure 7.1 – Components of Network Rail efficiency challenge



7.24. Network Rail is proposing to phase these additional efficiencies across years three, four and five of CP6, to avoid destabilising the routes' delivery plans at the start of the control period. Also the volume of renewals being delivered is much larger in years three, four and five, which provides more opportunities to increase efficiency.

Our assessment of Network Rail's proposal

7.25. We have reviewed Network Rail's proposal to assess whether:

- it addresses the concerns we raised about headwinds and efficiencies in our draft determination;
- the magnitude of challenge is stretching, but reasonable; and
- the phasing is reasonable.

7.26. Our review identified that the Scotland route had proposed to include materials purchased in CP5 as an efficiency in CP6. This does not meet the criteria for an efficiency in CP6 and is misleading, as it would artificially increase the efficiency reported by the route in CP6, when costs were actually incurred in CP5. We have subsequently discussed this with Network Rail and it has confirmed that this will be corrected, by removing £7.8m from the CP6 efficiency plans and also removing £7.8m from the CP6 base costs. This reduces Network Rail's efficiency challenge from £671m to £663m. However, the impact of the efficiency proposal on funding is unchanged, at £491m, because of the £7.8m reduction in base costs.

7.27. We also challenged the phasing of Network Rail's efficiency proposal as we thought it was unrealistic to assume that it could deliver the efficiencies it had identified in year one. Network Rail responded well to this challenge, reviewed its plans and adjusted its proposal by moving £50m of efficiencies from year one to years two and three of CP6. This better reflects how these efficiencies will be delivered, so we have agreed to this proposal.

7.28. We have decided to accept the proposal for headwinds and efficiencies (with the corrections noted above) on the basis that:

- it represents a major improvement on the SBP and provides additional funding for asset sustainability, R&D and safety related activities in CP6;
- Network Rail has made significant efforts to address our concerns and the scale of their efficiency challenge (£663m) is comparable to our challenge (£659m); and
- we are satisfied that the routes were involved in planning and quantifying Network Rail's efficiency challenge and that all the routes have taken ownership of their efficiency challenges for CP6.

7.29. The effect of these changes on headwinds and efficiencies figures in the SBPs is illustrated in Table 7.2

Table 7.2 – Effect of Network Rail efficiency proposal on SBP headwinds and efficiencies

Route	SBPs		Additional efficiency proposal		Revised Headwinds & Efficiencies	
	Headwinds £m	Efficiencies £m	Headwinds £m	Efficiencies £m	Headwinds £m	Efficiencies £m
Anglia	49	(212)	(29)	(27)	20	(239)
LNE&EM	152	(323)	(22)	(90)	130	(414)
LNW	129	(429)	(35)	(69)	94	(498)
South East	109	(309)	(18)	(44)	91	(354)
Wales	39	(92)	(7)	(23)	32	(115)
Wessex	90	(188)	(21)	(24)	69	(212)
Western	57	(192)	(14)	(32)	43	(225)
Scotland	85	(218)	(35)	(16)[1]	50	(234)
Central	77	(401)	(101)	(56)	(24)	(457)
Totals	788	(2,366)	(281)	(382)	506	(2,748)

Source: Network Rail (2017-18 prices)
[1] Includes a correction for the £7.8m cost reduction misclassified as an efficiency
Note: The structure of this table reflects the structure of our cost assessment. In the route settlement annexes, we include the central efficiencies in the route that they relate to.

7.30. Although Network Rail's proposal meets our challenge on efficiency, it does not release the level of net funding which we anticipated in the draft determination. We think that having a significant efficiency challenge, which the routes have taken ownership of, is an important improvement to accountability. Therefore, we have accepted Network Rail's proposal.

Other relevant considerations

7.31. As well as the quantitative assessment of efficiencies discussed above, we have noted a number of other matters as being relevant to Network Rail's overall efficiency proposals. These are discussed below.

7.32. Network Rail has not performed well over recent years in terms of delivering efficiently against either its plans or ORR's determination. In important areas it is now substantially less efficient than at the end of CP4.

7.33. Compared with our PR13 determination (but expressed in 2016-17 prices), Network Rail spent approximately £3.0bn more on maintenance and renewals work delivered in Great Britain in the first three years of CP5.

- Renewals accounted for the biggest part of this underperformance at £2.7bn for the three years in total.
- Maintenance underperformance for the three years in total was approximately £0.3bn.

7.34. In 2017, we studied the underlying causes of the deterioration in renewals efficiency[70]. In our view there was evidence that material factors affecting trends in efficiency included:

- Network Rail was poorly prepared to deliver renewals at the start of CP5;
- its PR13 efficiency improvement plans were not well founded;
- the company reacted slowly to the problems on efficiency; and
- there was increased pressure on access to the railway to carry out work.

7.35. The reclassification of Network Rail into the public sector in 2014, with the introduction of fixed borrowing limits, meant that when problems arose they led to repeated re-planning of work to stay within the new funding constraints. We also highlighted that devolution to routes had initially led to unaffordable increases in the scope of work in some areas, as local teams delivered additional work for their customers. This compounded affordability constraints elsewhere.

7.36. We are conscious that Network Rail's planned efficiencies at the start of CP6 represent a significant improvement from the efficiencies currently being achieved at the end of CP5. We will monitor Network Rail's delivery closely at the start of the control period, to ensure that the planned efficiencies remain achievable[71]. The efficiency challenge is mainly phased over the later years of CP6, so it should not exacerbate this concern.

Future efficiency challenges

7.37. Since the draft determination, we have commissioned additional analysis of Network Rail's efficiency, through external benchmarking with other infrastructure managers and internal benchmarking between the routes[72].

7.38. Both internal and external benchmarking indicated the potential for Network Rail to increase efficiencies significantly from the levels assumed in the SBPs. This supports our view that the level of efficiency challenge for CP6 is reasonable.

7.39. The efficiency challenges in the final determination represent an increase in efficiency from about 8% to about 10%. The internal benchmarking analysis indicated that it should be possible for Network Rail to achieve efficiencies in excess of 12%. The study suggested that the most potential for improvement is associated with increased stability of workbanks and more efficient arrangements for delivery of

[70] *Improving Network Rail's renewals efficiency: a consultation*, ORR, July 2017. This may be accessed here.
[71] For more information, see the PR18 conclusions on our approach to assessing Network Rail's efficiency, located here.
[72] Evidence on Top Down and Bottom-up Efficiency Adjustments for Network Rail's CP6 Maintenance and Renewals, CEPA Ltd, 8 October 2018. This may be accessed here.

maintenance (noting that Network Rail's efficiency challenge was largely focussed on renewals).

7.40. While we accept Network Rail's proposed efficiency challenge for CP6 business plans, we require the company to develop a pipeline of further efficiencies, with a view to increasing the security of CP6 targets and continuous improvement into future control periods.

Conclusions

7.41. Overall, we consider that the route-based strategic plans are a significant improvement on the SBPs submitted in CP5. They benefit from improved asset management, cost planning and delivery planning processes, and are based on bottom-up analysis of the work that individual route teams consider should take place over CP6. This forms a good basis to plan and deliver efficiencies.

7.42. The plans identify a range of efficiency savings, including route-led initiatives. We have reviewed these efficiency plans to consider whether there is reasonable evidence that the plans are credible. We found a range of evidence that supported a view that further efficiency savings should be deliverable. This includes:

- the long-term trends in Network Rail's efficiency, and the fact that the business plans have been prepared against a background of a period of unusually poor performance on efficiency. This will have affected perceptions of what can be delivered and what can be committed to, through the inevitable conservatism that would follow a period of sustained poor performance;
- the benefits that should flow from recent changes to how Network Rail is organised – notably the increased role of routes;
- further benefits that should flow from changes that Network Rail has recently put in place to provide routes with greater freedom to deliver work in the most efficient way and to influence areas of cost where they do not enjoy this freedom; and
- the period of stability provided by the terms of the funding settlement.

7.43. In this context, our analysis of the SBPs for the draft determination identified that:

- there may have been areas in the plans where Network Rail had not consistently applied its own guidance in establishing CP6 core pricing for pre-efficient renewals costs. We were concerned that estimating processes did not provide full transparency over the removal of inappropriate inefficiencies which arose in CP5 from the rates used to establish the CP6 base price;
- there were a range of examples where efficiency has not been fully factored into individual plans (but where there was not widespread or sufficient evidence to support adjustment across Network Rail's plans);

- our review of support costs identified a number of areas where inefficient costs were included in the SBPs. We concluded that this analysis supported the overall case for increasing the efficiency challenge on Network Rail; and
- the headwinds had been over-estimated, and lacked clear justification.

7.44. Our view that additional efficiencies should be found is supported by an additional study which we undertook after completing the draft determination[73].

7.45. Rather than proposing individual adjustments to efficiencies in Network Rail's plans, we set an overall efficiency challenge based on our analysis of concerns about headwinds arising from an independent reporter review of the routes' proposals. We used this as a proxy for the overall scale of potential efficiency savings. This was the basis for the efficiency challenge in our draft determination of £659m (of which the England & Wales share was £586m with £73m for Scotland). We estimated this would raise the company's efficiency forecast from 8% to about 10% in England & Wales and from 9% to about 11% for Scotland. In broad terms, this would return the company back to the efficiency levels seen in CP4.

7.46. Network Rail has responded with proposed additional efficiencies of £671m, however we identified that £7.8m of this was misclassified, resulting in a corrected total of £663m.

7.47. Of this £663m of additional efficiencies, £573m affects England & Wales, while £90m affects Scotland. £180m is a re-allocation from headwinds to base costs and there will be a £7.8m reduction in base costs for a misclassified efficiency, so the net impact on funding is £491 (£428m for England & Wales, £63m for Scotland).

7.48. We have reviewed Network Rail's response and we have decided to accept its efficiency challenge in our final determination.

7.49. In the context of Network Rail's current efficiency levels at the end of CP5, achieving the target efficiencies at the start of CP6 and continued improvement during the control period will be challenging, but we recognise that the company has the potential to meet this challenge and to realise further gains.

[73] Evidence on Top Down and Bottom-up Efficiency Adjustments for Network Rail's CP6 Maintenance and Renewals, CEPA Ltd, 8 October 2018. This may be accessed here.

Significant changes since draft determination

No.	Subject	Affected paragraphs
1	Basis of draft determination and establishment of efficiency challenge simplified.	7.1 - 7.16
2	Summary of Network Rail's response to the draft determination inserted.	7.17 - 7.24
3	ORR's assessment of Network Rail's response.	7.25 - 7.30
4	Other relevant considerations revised in light of revised proposal	7.31 - 7.36
5	Consideration of future efficiency challenges inserted.	7.37 - 7.40
6	Conclusions revised to reflect revised proposal.	7.41 - 7.49

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