3. Output framework

Key messages in this chapter

- The output framework consists of outputs which Network Rail must deliver for the money it receives, indicators which we use for monitoring purposes and 'enablers' which assess the capability of the company not just in the short term, but over the longer term.
- We have set challenging but achievable outputs in areas that matter most to passenger and freight customers.
- There will be a new output to reduce risk at level crossings and more level crossings will be closed.
- We are significantly strengthening the requirements on Network Rail to improve the management of its assets. There will be specific quality standards for the company's knowledge of its assets and requirements to improve its asset management capability.
- A major programme of improvement works will transform travel in and between urban areas, with existing major projects such as Crossrail, the Edinburgh to Glasgow improvement programme and Thameslink completed and the completion of new projects such as the electrification of the Welsh Valley lines (covered in detail in chapter 9).
- There will be an output to achieve 92.5% of passenger trains on time by 2019, despite growing passenger and freight demand. The focus will be on improving services in the worst performing areas, with a new output for all franchised train operating companies in England & Wales to have at least nine out of ten trains on time by 2019.
- There will be a new measure of freight train service performance, the freight delivery metric, with 92.5% of freight trains to be on time.
- Disruption to passengers and freight will be lower at the end of the control period than it is today. Because of the large programme of improvement works on the network, there may be increased local and short-term disruption, but this will be kept to a minimum.

Key messages in this chapter (continued)

- We will give the industry flexibility to set performance improvements where possible, within our overall framework. This should strike the right balance between delivering growth and improving services.
- We expect Network Rail to set an ambitious environmental agenda, with stretching carbon reduction trajectories and a greater focus on making assets resilient to climate change and extreme weather.
- There will be new measures which will help us assess how well Network Rail is improving its customer service, its management of large investment programmes and its 'system operator' – how well it runs the infrastructure – capability.
- We are introducing a change control mechanism to potentially adjust Network Rail's passenger train service performance outputs if franchises are let with train service performance requirements that are materially inconsistent with Network Rail's outputs.
- This determination will considerably improve transparency by requiring more, and better quality information, to be made publicly available in an accessible format.

Structure of this chapter

3.1 This chapter is structured as follows:

(a) the **introduction** explains the choices involved in setting outputs, the wider framework, and the process for setting the framework in CP5. It then briefly summarises the main outputs we have set;

(b) the **HLOS** section very briefly summarises the HLOSs;

(c) the **outputs consultation** section explains the rationale behind the output framework we consulted on in August 2012, and differences to the CP4 output framework;

(d) the **responses to our consultation** section summarises the feedback we received on our outputs consultation;

(e) the **Network Rail's proposals** section outlines how the output framework put forward in Network Rail's SBP differed to that in our consultation;

(f) the **our decisions** sections confirms the outputs, indicators and enablers we are setting for CP5; and

(g) the **next steps** section explains how the process concludes.

Introduction

Choices around outputs

3.2 We needed to decide what Network Rail should deliver – what are the company's outputs in return for the money it receives? Currently these outputs are set in terms of areas such as train service reliability (the percentage of trains arriving on time), the delivery of enhancement projects and reducing disruption to passengers from engineering work.

3.3 Having decided what areas we should set outputs for, we then needed to decide the level at which the output should be set and the time period for which the output should apply (e.g. should there be a different requirement for each year?). There is a further choice about the level of disaggregation – do we set outputs for, say, the whole of England & Wales, or should we also set outputs at the level of the route or train operator. Finally, we needed to decide whether there should be a change control process to allow outputs to be amended during CP5 in certain circumstances.

3.4 We wanted to set outputs in the areas that matter most to passengers and freight customers. But we needed to take into account wider factors. Just setting more and more outputs is not necessarily a good thing as it may constrain Network Rail so far that it increases the risk the company faces and potentially increases costs. We also wanted to give Network Rail flexibility to work with the industry to deliver in a way which maximises value for money.

The output framework

3.5 In this control period, CP4, we have defined outputs but we have also defined indicators which we use for specific monitoring purposes. For example, we have asset condition indicators to make sure that Network Rail is not meeting its outputs by storing up problems for the future by 'sweating the assets'.

3.6 In addition, during the course of CP4, we defined 'enablers' which assess the company's capability to deliver future improvements (i.e. not just within, but beyond, the current control period) in outputs and / or efficiency.

3.7 It is this combination of outputs, indicators and enablers that we call the output framework.

3.8 The crucial difference in terms of regulation between outputs and enablers / indicators is that if Network Rail fails to deliver the outputs we would consider whether this amounts to a licence breach and hence we may take enforcement action against the company (hence outputs are often referred to as 'regulated outputs'). A failure to deliver either an enabler or an indicator would not in itself be considered as a potential licence breach. However, either may indicate trends which raise concern about Network Rail's likely future compliance with an output that we may want to take licence enforcement action to address.

The process for setting the output framework

3.9 The process for setting the output framework started with the advice we provided to the Scottish Ministers and the Secretary of State in March 2012. Following this:

(a) in June/July 2012, the HLOSs were published;

(b) in August 2012, we published our outputs consultation;

(c) in January 2013, Network Rail published its SBP;

(d) in June 2013, this draft determination was published;

(e) in October 2013, we publish our final determination;

(f) in December 2013, Network Rail publishes its draft delivery plan; and

(g) in March 2014, Network Rail publishes its final delivery plan.

Brief summary of the CP5 outputs

3.10 Because this is an extended process, in some ways it is easier to briefly describe our decisions so far, and then describe each stage for getting to this point. For CP5 we have again developed a framework based on outputs, indicators and enablers. Our decisions to date are summarised in Tables 3.1 and 3.2 (the full output framework is shown in Table 3.11).

3.11 The rest of this chapter describes each stage of the process for setting outputs, leading to more detail on our decisions, then describes how the process concludes.

3.12 All national outputs include franchised and open access operators.

Table 3.1: Summary of our decisions on CP5 outputs

Area	Outputs
Train service reliability	• PPM[55] for England & Wales (annual[56] and CP5 exit of 92.5%), Scotland (annual 92% and CP5 exit of 92.5%) and franchised TOCs in England & Wales (rolling annual output JPIP and no TOC to exit CP5 below 90%) • CaSL[57] (England & Wales annual and CP5 exit of 2.2%) • Freight Delivery Metric[58] (National annual 92.5%)
Enhancements	• Enhancement projects to be delivered. Scheme delivery milestones (set in an enhancements delivery plan). Milestones for delivery of projects in ring-fenced funds. • Development milestones for early stage projects
Health and safety	• Network Rail required to deliver a plan to maximise the reduction in risks of accidents at level crossings, using £67m ring-fenced fund [59]
Network availability[60]	• PDI-P (National CP5 exit of 0.539) • PDI-F (National CP5 exit of 0.593)
Network capability	• Base requirement at start of CP5 in terms of track mileage & layout, line speed, gauge, route availability, electrification type[61]
Stations	• Station Stewardship Measure (SSM) by station category, and Scotland (annual)[62]
Asset management[63]	• Asset management excellence model (AMEM) capability for each core group at National level • Asset data quality for each asset type at National level • Milestones for ORBIS (Offering Rail Better Information Services)

[55] Public performance measure (PPM) is the proportion of trains that arrive at their final destination on time. A train is defined as on time if it arrives within five minutes of the planned destination arrival time for London & South East and regional services; or ten minutes for long-distance services.

[56] See Table 3.4 for annual PPM outputs.

[57] CaSL (Cancellations and Significant Lateness) is a combined measure of punctuality and reliability. It is a percentage measure of scheduled passenger trains which are either cancelled (including those cancelled en route) or arrive at their scheduled destination 30 or more minutes late.

[58] Freight Delivery Metric (FDM) measures the percentage of freight trains arriving at their destination within 15 minutes of scheduled time. It only covers delay caused by Network Rail.

[59] Note safety is not a devolved responsibility so all safety related outputs, indicators and enablers apply to England, Wales and Scotland.

[60] The Possession disruption index – passenger (PDI-P) and Possession disruption index – freight (PDI-F) measure the level of disruption caused by possessions over a period of time.

[61] This output provides for a minimum level for the whole network. The capability of some parts of the network will improve during CP5 as a result of the enhancement programme.

[62] See Table 3.5 for outputs.

[63] See 'Our decisions on asset management' section for outputs.

Table 3.2: CP5 output framework – summary of indicators and enablers

Area	Indicators	Enablers (these support all output areas)
Train service reliability	• PPM: sector and service group • Right-time performance[64]: England & Wales, Scotland, sector, JPIP and service group • Average lateness[65]: England & Wales, Scotland, sector and JPIP • CaSL: sector and service group • Delay minutes, split by category (including Network Rail on TOC, TOC on self and TOC on TOC): for National, England & Wales, Scotland, sector, Network Rail route and JPIP • Freight delay minutes, national and strategic freight corridor • Scotland KPI package[66]	• Safety management maturity (Railway Management Maturity Model – RM3) • System operator capability • Programme management capability • Customer service maturity
Enhancements	• Enhancement fund KPIs (e.g. average scheme benefit cost ratios) • Improved governance processes for HLOS funds • Project activities and milestones	
Depots	• Light Maintenance Depot Stewardship Measure: England & Wales, Scotland and National	
Asset management	• Asset condition for robustness and sustainability at National and route level • AMEM lite capability by core group at route level • Renewal and maintenance volumes by asset type and spend at National and route level	
Environment	• Scope 1[67] and 2[68] traction and non-traction carbon dioxide emissions: England & Wales and Scotland • Carbon intensity: England & Wales and Scotland • Carbon embedded in new infrastructure • Sustainable development KPIs	
Other	• Passenger satisfaction • Journey time • Cross-border service availability	

[64] Right-time performance measures the percentage of trains arriving early or within 59 seconds of schedule.

[65] The average lateness of trains at the stops along its route.

[66] See section 3.61.

[67] Scope 1 carbon dioxide emissions result from activities directly under the control of Network Rail.

[68] Scope 2 carbon dioxide emissions are those resulting from energy purchased by Network Rail. These emissions are as a result of Network Rail's activities, but not directly under its control.

The HLOSs

3.13 The HLOSs[69] are a 'given' and where appropriate their requirements have been included as outputs in this determination.

3.14 The Secretary of State's HLOS included a requirement for PPM in England & Wales to reach 92.5% (MAA[70]) by the end of CP5, funding for a number of enhancement projects to be delivered, and provided funding for ring-fenced funds to deliver certain strategic objectives, such as station improvements. There was also the option for PPM to be higher, and CaSL lower: "if the ORR determines this is value for money and can be affordably achieved without compromising delivery of other HLOS requirements".

3.15 The Scottish Ministers HLOS specified an end CP5 92.5% PPM (MAA) requirement (and annual requirements of 92%), enhancement schemes to be delivered and ring-fenced funds e.g. to close level crossings. There was a requirement to set up a process to make journey time improvements and keep at least one cross-border route available at all times.

Outputs consultation

3.16 In August 2012 we consulted[71] on the proposed CP5 output framework. We included the requirements of the HLOSs. In some areas we described how we would set the HLOS outputs in more detail e.g. set enhancement obligations in the form of detailed enhancements milestones, as in CP4, to give clarity to what will be delivered and when, and maintain the CP4 change control mechanism.

3.17 But we also said that we wanted to go beyond the HLOSs and;

(a) strengthen the focus on asset management, to emphasise the importance of Network Rail becoming an excellent asset manager. We proposed that we set some asset management measures as outputs;

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[69] *High Level Output Specification 2012,* Department for Transport, July 2012 is available at https://www.gov.uk/government/publications/high-level-output-specification-2012 and the *High Level Output Specification 2012*, Transport for Scotland, June 2012 is available at http://www.transportscotland.gov.uk/strategy-and-research/publications-and-consultations/j232012-00.htm.

[70] Moving annual average (MAA) – the average of the last 13 four-week time periods.

[71] *Network Rail's output framework for 2014-19*, Office of Rail Regulation, August 2012, available at http://www.rail-reg.gov.uk/pr13/consultations/outputs.php.

(b) replace our CP4 freight delay minutes output with 'freight CaSL', to measure success against an output more closely linked to freight operator priorities (freight performance was not specified in the HLOSs);

(c) focus outputs on train operators / services rather than Network Rail routes, setting PPM and CaSL outputs by TOC, but monitor indicators of Network Rail's performance at route level;

(d) continue and extend the use of enabler measures of Network Rail's capability to deliver, to monitor progress of Network Rail's capability;

(e) establish new environmental indicators, to define Network Rail's role in sustainable development; and

(f) introduce and monitor a 'whole industry scorecard' to give context to our assessments of delivery (see chapter 23).

3.18 The main differences between the proposed CP5 output framework, and our existing CP4 framework, are that for CP4:

(a) performance outputs were set at sector level;

(b) Network Rail caused delay minutes (to passenger and freight operators) were set as an output in CP4 but would not be in CP5; and

(c) we did not set any asset management outputs in CP4, although we did specify asset management maturity scores as an enabler during CP4.

3.19 We also published the findings of a review[72] by the independent reporter Arup, of the effectiveness of the CP4 output framework. We have explained how Arup's findings are taken into account, in our determination of the output framework, in each 'our decisions' section of this chapter.

3.20 Table 3.3 shows the proposed CP5 output framework in our consultation.

[72] *CP4 regulated outputs*, Arup, August 2012, is available at http://www.rail-reg.gov.uk/pr13/consultations/outputs.php.

Table 3.3: Outputs consultation: proposed CP5 output framework

Area	Outputs	Indicators	Enablers (these support all output areas)
Train service reliability	Passenger - PPM: England & Wales, Scotland - PPM by operator - CaSL: England & Wales, Scotland - CaSL by operator Freight - Freight CaSL	Right-time performance (by operator) Average lateness (by operator/service group) Network Rail caused delay (by route) Suite of cause of delay indicators	Asset management excellence, by route Safety management maturity New system operator capability enabler, which could cover: Process of assembling, validating and publishing the timetable Possessions planning Understanding / measuring capacity availability and utilisation Network planning Network change Possible further measures including customer service maturity
Enhancements	Enhancement scheme delivery milestones (set out in an enhancements delivery plan)	Enhancement fund KPIs (e.g. average scheme benefit cost ratios) Improved governance processes for HLOS funds	
Safety	Level crossing risk reduction plan delivery milestones		
Network availability (reducing disruption from engineering works)	PDI-P (or alternative measure proposed by the industry) PDI-F (or alternative measure proposed by the industry)	Possession indicator report metrics	
Network capability	Base requirement at start of CP5 in terms of track mileage & layout, line speed, gauge, route availability, electrification type		
Stations	Station condition measure (existing SSM measure migrating to new measure in CP5)		
Depots		Average condition score	

Area	Outputs	Indicators	Enablers (these support all output areas)
Asset management	Asset management excellence capability Asset data quality Milestones for ORBIS / operating strategy project	New indicators for asset policy delivery, and asset performance / condition monitoring More transparent condition reporting	
Environment		Indicators demonstrating reductions in carbon dioxide emissions associated with OMRE[73]sector Carbon and energy efficiency KPIs Carbon embedded in new infrastructure Sustainable development KPIs (to be determined)	
Other		Journey time indicator Station accessibility indicator Indicators of improvements in passenger information Possible supply chain engagement indicator Possible levels of innovation indicator	

Responses to our consultation

3.21 We received responses from a wide range of passenger / freight representatives, passenger / freight operators, funders, suppliers and Network Rail. Very broadly, consultees:

(a) supported our proposed output framework structure;

[73] OMRE refers to operating, maintenance, renewals and enhancement activity.

(b) believed the CP4 approach to enhancements delivery plan milestone obligations and change control worked well, and supported its continuation into CP5;

(c) welcomed the introduction of a whole industry scorecard to set Network Rail's performance in a wider context;

(d) agreed obligations should be operator / service-focused (rather than Network Rail route focused) where possible, although ORR should still monitor indicators at route level;

(e) supported new indicators such as right-time performance and station accessibility;

(f) believed a journey time indicator is a good idea but hard to define; and

(g) welcomed our drive towards a more transparent output framework and monitoring process.

3.22 There was disagreement on:

(a) the status of asset management outputs – in particular, while Network Rail emphasised the importance of improved asset management, it did not believe it should be subject to regulated outputs in this area;

(b) the appropriateness and practicality of a trade-off / change control mechanism, in particular in relation to HLOS outputs; and

(c) the extent of regulated output obligations set, as opposed to indicators and enablers.

Network Rail's proposals

3.23 Network Rail's SBP proposed its own framework. The main differences between Network Rail's proposal and the output framework in our consultation were:

(a) no asset management outputs – Network Rail believes we should not set outputs for asset management measures, as this would be a move towards input-based regulation;

(b) performance indicators – Network Rail did not commit to reporting right time performance (in England & Wales) or average lateness;

(c) no journey time indicators – Network Rail's view is this would be too complex to create and implement in a meaningful fashion;

(d) no station accessibility measure – Network Rail considers there are existing legal commitments in this area and an indicator could therefore lead to confusion over accountability;

(e) passenger information – Network Rail sees this as best measured through the National Passenger Survey and therefore should not be a metric in the output framework;

(f) supply chain engagement/innovation – Network Rail believes there are existing metrics and is working on developing new metrics that can measure progress outside the output framework; and

(g) no safety management maturity enabler – Network Rail does not believe RM3 is an appropriate enabler as it sees this as a move towards input-based regulation.

Our decisions on outputs

3.24 The following sections confirm the decisions we have taken in each output area. In each section we have explained the decision we needed to make, analysis we undertook and the output, indicator or enabler we are setting. Our decisions are structured around the following areas:

(a) train service reliability (passenger and freight performance);

(b) enhancements (investment projects);

(c) health and safety;

(d) network availability (disruption from possessions[74]);

(e) network capability (speed and type of trains that can operate on the network);

(f) stations and depots;

(g) asset management;

(h) environment; and

[74] Network Rail needs to restrict access to its network to carry out many of its maintenance and renewals activities. These restrictions of access are referred to as possessions.

(i) other (system operator capability, programme management capability, customer service maturity, passenger satisfaction, journey time and cross-border route availability).

Our decisions on train service reliability

3.25 We have reviewed Network Rail's SBP and commissioned analysis from the independent reporter Nichols[75].

3.26 This section is structured as follows:

(a) background on CP4 performance;

(b) whether Network Rail's SBP contains sufficient evidence that the England & Wales HLOS PPM and CaSL requirements will be met. As Network Rail presented much of its analysis on a 'probability' basis, i.e. a percentage likelihood that it would hit the HLOS requirement, we have reviewed this to understand whether Network Rail's plans will deliver the HLOS requirements. If it appeared that they would not, we would require the company to do more;

(c) whether there is an affordable, value for money case for increasing England & Wales PPM and CaSL outputs, to answer the question raised in the Secretary of State's HLOS about whether the requirement should be tightened;

(d) whether the end CP5 England & Wales HLOS PPM and CaSL outputs should be supplemented with additional annual outputs and the proposed level of these outputs. As related issues it considers whether there should also be sector level outputs or other outputs such as delay minutes;

(e) if TOC level outputs for PPM and CaSL (in England & Wales) should be set and, if so, how that should be done. In particular, whether a process should be introduced whereby the industry sets TOC level outputs annually, subject to our oversight, and whether each TOC level output should have to reach a minimum level;

(f) what indicators we should specify, and at what level;

(g) whether Network Rail's SBP contains sufficient evidence that the Scotland HLOS PPM requirements will be met; and

[75] *HLOS Performance and Reliability Analysis and Targets review*, Nichols, April 2013, available at http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

(h) whether freight outputs based on FDM should be established, whether these should be annual outputs and the level of this output.

Background on CP4

3.27 Network Rail has had a number of problems delivering its PPM (MAA) outputs in CP4 and we have taken licence enforcement action. As a result of our concerns regarding performance in the long distance sector[76] we carried out an investigation and required Network Rail to develop a performance recovery plan. We accepted Network Rail's plan for 2012-13 but found a likely future licence breach for 2013-14. We made an order containing a reasonable sum which will require Network Rail to pay £1.5m for every 0.1 of a percentage point that performance falls short of the regulated PPM (MAA) output.

3.28 Network Rail proactively produced recovery plans for the London & South East[77] and regional[78] sectors when it became clear that its outputs might not be achieved.

3.29 In Scotland performance was poor in the early part of the control period but good cooperation and strong management by Network Rail and First ScotRail leave it in a strong position to be ahead of its PPM (MAA) output at the end of CP4.

3.30 Freight performance was poor in the early part of CP4. We established the Freight Recovery Board in January 2012. This generated effective, collaborative working across the industry stimulating an improvement in performance.

England & Wales: will the PPM and CaSL outputs be met?

3.31 Network Rail presented its forecasts in terms of probability distributions – it calculated how likely it was that it would deliver different levels of PPM and CaSL.

3.32 Network Rail reviewed all the plans from its operating routes, summed their impacts and calculated that there was a 25% chance that it would hit the HLOS requirements.

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[76] The long distance sector is the industry sector of operators operating long distance services; Cross Country, East Coast Trains, East Midlands Trains, First Great Western, Greater Anglia, and Trans Pennine Express and Virgin Trains. Train operating companies can operate services in more than one sector. For example, First Great Western operate services in each of the three sectors; London & South East, long distance and regional.

[77] The London and South East sector is the industry sector comprising of services operated by the following operators; South Eastern Railway, Southern Railway, South West Trains, First Great Western, Chiltern, London Midland, First Capital Connect, Greater Anglia, C2C and London Overground.

[78] The regional sector is the industry sector comprising of services operated by the following operators; Arriva Trains Wales, First Great Western, London Midland, Northern, East Midlands Trains, and Merseyrail.

However, it then added in a number of national and TOC initiatives that would improve performance and this increased the level of confidence to 75%.

3.33 Nichols found much of the analysis to be reasonable, but considered that Network Rail had underestimated the performance benefit from implementation of the Traffic Management System (TMS), enhancements, CP4 and CP5 national initiatives and fleet reliability. Nichols also considered that Network Rail had potentially over-estimated the negative impact of traffic growth on performance.

3.34 In its SBP, Network Rail assumed it will achieve its CP4 exit outputs for PPM and CaSL. However, both Network Rail's and Nichols's latest assessment indicates that these are not likely to be met. Nichols also considered that Network Rail had under-estimated the negative impact of severe weather on performance.

3.35 Taking all this into account we have concluded that there is around a 45% confidence of Network Rail achieving the HLOS PPM output and around a 50% confidence of Network Rail achieving the HLOS CaSL output based on Network Rail's route and national plans.

3.36 At this stage of the process, with nearly a year of CP4 to run, we see this as challenging but achievable and believe that it represents a reasonable degree of confidence. We have therefore decided to set a CP5 exit output of 92.5% for PPM (MAA) and 2.2% for CaSL (MAA) as outputs.

England & Wales: should the HLOS PPM and CaSL outputs be increased?

3.37 The England & Wales HLOS has an option for the end CP5 national PPM (MAA) output of 92.5% to be increased and CaSL (MAA) output of 2.2% to be reduced (unlike PPM, a lower CaSL rate is better) if this demonstrated value for money, was affordable and did not compromise delivery of other HLOS requirements.

3.38 Network Rail did not explicitly consider this as it felt the initial industry plan (published previously) was clear it would not be value for money. Nichols carried out an assessment of the potential impact of setting a higher national level output for PPM or CaSL, in terms of value for money, affordability and trade-off with other outputs, but noted the difficulty of calculating this at the national level. Its assessment of value for money and affordability showed that the cost of driving further performance improvement was increasingly difficult as performance itself improved. Therefore, it is likely that the case for targeted investments will be strongest on those routes or

service groups which are the worst performing services or those with the highest economic impact.

3.39 Taking all this into account we have concluded that the PPM and CaSL outputs for England & Wales should not be increased beyond those specified in the HLOS.

Additional England & Wales performance outputs

3.40 The following section reviews whether we should set further performance outputs in this determination.

3.41 The first issue is whether to supplement the end CP5 PPM and CaSL outputs with annual outputs. In our outputs consultation we said it is important to set outputs year-by-year, to drive progress towards the end CP5 output and to ensure passengers' ongoing interests are not compromised in the delivery of the end CP5 output. On balance we have decided that it is important that annual performance is broadly maintained during CP5 hence we have set annual outputs. We also see these annual outputs as an important 'anchor' for TOC level outputs.

3.42 Network Rail's phasing to deliver HLOS assumes a CP4 exit level of 92.5% for PPM (MAA) and 2.2% for CaSL (MAA). Based on our own analysis and Network Rail's latest forecasts, the entry point into CP5 is likely to be lower than stated in the SBP.

3.43 Therefore, we have decided to set the annual outputs for PPM and CaSL in Table 3.4 below, which reflect the lower CP5 entry point.

Table 3.4: Our decision on CP5 annual outputs for PPM and CaSL

	2014-15	2015-16	2016-17	2017-18	2018-19
CP5 PPM (MAA) England & Wales outputs	92.2	92.3	92.4	92.4	92.5
CP5 CaSL (MAA) England & Wales outputs	2.2	2.2	2.2	2.2	2.2

3.44 We then considered whether we should continue with the PPM and CaSL outputs by sector (long distance, regional, London & South East) that are in place for CP4. In our outputs consultation we pointed out that sector outputs put a greater focus on certain types of services, but they also add another layer of outputs which could be seen as unnecessary. Network Rail supports a move away from sector level outputs, although some operators pointed out that they are useful for comparative purposes.

3.45 There are benefits to aggregating services to sector level; for example holding similar operators to account and providing useful analysis of national performance. However, the approach has created some issues, for example during CP4 we implemented performance investigations at a sector level, despite the underperformance being driven by only one or two operators in that sector.

3.46 On balance we have decided not to maintain the sector level outputs. However, performance at a sector level will be reported as an 'indicator' for CP5 as we see benefits of being able to group operators together to provide an interim level between train operators performance and national performance.

3.47 In CP4 we also set outputs for Network Rail caused delay minutes for England & Wales, Scotland and freight. In our consultation we said we will not set delay minutes as outputs in CP5, as PPM is a more passenger focused measure. In their review of CP4 regulated outputs, Arup stated that delay minute outputs may drive Network Rail to focus more on delay attribution than on the root causes of delay. Network Rail has also not proposed to set delay minutes outputs for CP5.

3.48 During CP4 we concluded that it was most effective to focus on and hold Network Rail to account for delivery of the measures that most closely reflected the passengers' experience – PPM and CaSL. However, delay minutes are a useful measure for identifying performance trends and should continue to be reported as an indicator (see below).

Performance of individual TOCs

3.49 We needed to decide whether there should be performance outputs at franchised TOC level, and if so whether these outputs should be set by ourselves or the industry, and, as a related point, whether TOCs should achieve a minimum PPM by the end of the control period.

3.50 In our outputs consultation we said it is essential that PPM and CaSL outputs are set for each TOC, because Network Rail could otherwise try to meet the national output by focusing efforts and resources on some TOCs to the detriment of others. Network Rail's consultation response said it did not agree with ORR set operator level performance outputs, but proposed that TOC PPM trajectories are agreed via the

JPIP[79] process, and this had wider support in the industry. This approach has been discussed by the industry, and we have worked with the National Task Force to agree governance protocols for unsatisfactory or unresolved JPIPs.

3.51 We support the industry's proposal and commitment to the JPIP process and we have decided that PPM and CaSL in year one of the agreed two year JPIPs should constitute outputs (a rolling annual output). We expect Network Rail to include annual forecasts by operator in the CP5 delivery plan and to update these forecasts during the control period. We also agree that an escalation process, culminating in a referral to ourselves and DfT / Transport Scotland is appropriate if outputs cannot be agreed (see chapter 23 on monitoring).

3.52 We have decided that there should be a minimum point such that no franchised TOC in England & Wales exits the control period with a PPM (MAA) of less than 90%; this will be an output and is consistent with our CP4 determination which was based on getting all TOCs to 90% (although this will not be achieved). A minimum level of 90% would not significantly impact on the CP5 national output level as the poorest performing TOCs run relatively few services and therefore have a relatively small impact on national PPM.

Performance indicators

3.53 We needed to decide what performance indicators should be reported in England & Wales to enable us to understand factors causing variance from the regulated outputs, and whether:

(a) trajectories should be set for these indicators; and

(b) the level of disaggregation at which these should be reported.

3.54 Our draft determination for CP5 includes fewer performance outputs than were set in CP4, when sector level outputs and outputs for delay minutes were set. However, it is essential that a number of other indicators are reported in order to help us understand performance and monitor risk to delivery of the regulated outputs.

3.55 We have concluded that the following data should be reported each period to enable the understanding referred to above:

[79] Joint performance improvement plans (JPIPs) are based on a two-way obligation of Network Rail and the train operating company (TOC) to improve performance

(a) delay minutes, split by category (including Network Rail on TOC, TOC on self and TOC on TOC) for National, England & Wales, sector, Network Rail route and JPIP;

(b) PPM by sector and service group[80];

(c) CaSL by sector and service group;

(d) PPM and CaSL at TOC level (annual as an output);

(e) right-time performance by England & Wales, sector and JPIP;

(f) average lateness by England & Wales, sector and JPIP; and

(g) freight delay minutes, nationally and by strategic freight corridors.

3.56 We require Network Rail to publish data related to these measures in a transparent and accessible manner. Network Rail should set trajectories for all the above indicators at national level (this could be done in its JPIPs or FPIPs[81]). The trajectories will not constitute outputs, but variation from a trajectory may indicate a trend which raises regulatory concern about likely future compliance with an output.

Performance in Scotland

3.57 We needed to decide whether:

(a) the SBP contains sufficient evidence that the Scotland HLOS end of CP5 and annual PPM outputs will be met; and

(b) the proposed package of KPIs for Scotland addresses the additional HLOS requirements.

3.58 Network Rail has built a plan to deliver between 91.5% and 93% PPM by the end of CP5 and one of the key assumptions of this plan is for Scotland to outturn 92.0% at the end of CP4. However, at the end of year 2012-13, Scotland outperformed its outputs and our analysis shows that we expect Scotland to achieve better than 92.0% at the end of CP4, therefore increasing the confidence of delivering 92.5% at the end of CP5.

[80] A subset of operators' services most commonly used for performance analysis purposes.

[81] Freight performance improvement plans (FPIPs) are based on a two-way commitment by Network Rail and the freight operating company (FOC) to improve performance.

3.59 The second aspect of the HLOS requirement is for performance of each franchise let by Scottish Ministers to not fall below 92.0% in any given year of the control period. We recognise that there are potential performance risks, such as the Edinburgh to Glasgow Improvement Programme, however we believe that the anticipated CP5 entry point and the projected improvement in asset failure rates should enable Network Rail to deliver at least 92.0% in each year of the control period.

3.60 We have therefore concluded that Network Rail's SBP for Scotland is likely to deliver the HLOS output for PPM (MAA).

3.61 We are working with Network Rail, Transport Scotland and the Association of Train Operating Companies to develop a package of indicators to monitor performance in Scotland. The full package will be confirmed in our final determination, but will include:

(a) right time performance and PPM for ScotRail and ScotRail service codes;

(b) right time performance and PPM for long distance TOCs (Caledonian Sleeper services), peak time commuter services (heavily used and intermediate stations) and the 100 most heavily loaded trains; and

(c) trains run (normal plan, amended plan, actually run) during severe disruption.

3.62 This package will address the seven key objectives outlined in the Scotland HLOS and cover the most important aspects of passenger experience, focusing on heavily used trains and stations. It also acknowledges the importance of right-time operation, delivery in times of disruption and reliability of connections.

Addressing the poorest performing services or those with greatest economic impact

3.63 We needed to decide whether the plan outlined in Network Rail's SBP and supporting documentation to "focus on worst performing service groups" is adequate to meet the England & Wales HLOS expectation[82].

3.64 Network Rail identified the worst performing service groups in its SBP submission[83] and has ascribed a value (low, medium, high) to peak and off peak services within

[82] "In respect of both PPM and CaSL, the Secretary of State requires that the industry focuses on improving the worst performing routes and those on which lower levels of reliability have the greatest economic effect and would wish to see a plan is produced to this effect."

[83] See Appendix 2 to *CP5 strategic business plan supporting document – performance plan for England Wales and Scotland*, Network Rail, available at:

these service groups. This has generated useful analysis for identifying the services that should be targeted.

3.65 However, the performance plans for England & Wales and Scotland, and the supporting route plans do not include any detail for how performance of these service groups will be improved beyond the performance improvement that will be driven by the route and national activities outlined. Network Rail has confirmed it will include more detail in the JPIPs.

Freight performance

3.66 We needed to decide whether to have a freight performance output and if so what it should be.

3.67 Neither HLOS specified output requirements for freight train service performance, but it is important for freight customers that such an obligation is in place. In our outputs consultation we proposed development of a new freight measure based on passenger CaSL. Responses to our outputs consultation indicated that the current CP4 output (Network Rail caused freight delay per 100 train kilometres) was not directly relevant to freight end users and recommended it was replaced with a new measure.

3.68 The Freight Recovery Board has developed the FDM, which measures the percentage of freight trains arriving at their destination within 15 minutes of scheduled time. It only covers delay or cancellation caused by Network Rail.

3.69 Network Rail has modelled the relationship between the CP4 and CP5 measures which shows that its forecast CP4 outturn of 2.94 delay minutes per 100tkm is equivalent to 95.4% FDM.

3.70 Network Rail has proposed to introduce a national performance output of 95% for each year of CP5 and a performance floor of 91.35% with no regulatory intervention if performance remained above this level.

3.71 We agree that the FDM should replace delay minutes as the regulated output for freight performance. The FDM has been developed with agreement from the Freight Joint Board[84] and has a good level of industry and customer support. This aligns with

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http://www.networkrail.co.uk/browse%20documents/strategicbusinessplan/cp5/supporting%20documents/outputs/performance%20plan%20for%20cp5.pdf.

[84] The Freight Joint Board replaced the Freight Recovery Board, as a voluntary industry-led initiative.

Arup's review of CP4 regulated outputs, which concluded that a new freight measure should be developed that more accurately reflects the impact of Network Rail on freight flows.

3.72 We agree with Network Rail that outputs should be set at a national level as it is difficult to predict which freight operators will be operating paths throughout CP5.

3.73 We do not agree with Network Rail's proposals for a performance floor in CP5 of 91.35% as we believe that it is based on a number of downsides to performance and does not take into account any potential benefits. It also assumes that factors that could have an adverse effect on performance, such as traffic growth and increased speed, take effect on day one of the control period when we would expect these to be phased into any projection.

3.74 We have concluded that the output for FDM should be set at 92.5%, which reflects the uncertainty of the CP5 start position and downsides to performance during CP5 such as traffic growth, weather and engineering work. This output will be annual and has been set based on the assumption that improvement opportunities should reasonably offset downside risks.

3.75 FDM is a new metric and it will be important that we monitor it particularly carefully. We intend to use a number of supplementary indicators, including the CP4 measure (Network Rail caused freight delay per 100 train kilometres). We will also define other indicators to measure FOC caused delays. These indicators will not form regulated outputs, but are designed to provide information on areas which are not fully reflected in the FDM and act as a check against any perverse behaviour that might result from strategies designed to drive improvements against the FDM.

3.76 Network Rail and the freight operators are working on a wider set of initiatives to improve performance. For example, reducing FOC on TOC delays by better timetable planning and greater use of pre-validated paths and on the use of capacity in terms of reducing the number of paths in the timetable database that are not required.

Our decisions on enhancements

3.77 We said in the outputs consultation that we intend to continue to have milestones for enhancements in Network Rail's delivery plan and to have a change control mechanism. Both these approaches worked well in CP4 and are widely supported. Setting out when Network Rail will deliver each stage of a project, and keeping this

updated, is useful information for stakeholders and customers. We will use these milestones to monitor whether Network Rail is on course to deliver each project. We will categorise some of the milestones as outputs.

3.78 Although the outcomes of delivering enhancements are not specifically picked up in the National Passenger Survey they can be one of the biggest drivers of satisfaction in areas where the benefits are delivered. Therefore, we will make sure that outputs are based on the timing of the delivery of passenger and freight customer benefits, as this is what matters to customers. These will be finalised in the enhancements delivery plan, which will be published by Network Rail and agreed by us before the start of the control period. A draft will be published in December 2013 and open to wider consultation before being finalised by March 2014. In this way the delivery milestones will reflect stakeholder input, and the main issue here is likely to be ensuring a match between service level changes operators are trying to deliver and Network Rail's infrastructure changes. For example, matching up the delivery of longer platforms for when longer trains are expected to be introduced.

3.79 For projects at an early stage of development the regulated outputs in the March 2014 delivery plan will be to achieve GRIP 3 (see Table 9.2). After that they will be changed to the delivery milestones when these are defined. Detailed outputs of the enhancements projects are dealt with in chapter 9 alongside efficient costs, as the two are closely linked.

Our decisions on health and safety outputs

3.80 We needed to decide what outputs, indicators and enablers we will use to hold Network Rail to account on health and safety.

3.81 Network Rail has a legal obligation under the Health and Safety at Work etc. Act 1974 to maintain and, where reasonably practicable, improve health and safety.

3.82 We are setting one output for level crossings. Network Rail is required to deliver a plan of projects in CP5 to achieve the maximum possible reduction in risk of accidents at level crossings using the £67m ring-fenced fund made available by the Secretary of State. This is in addition to Network Rail's legal duty to reduce risk so far as is reasonably practicable.

3.83 Network Rail for the first time has produced a long-term strategy for health and safety and set its own vision and goals. These include, for example, eliminating all fatalities

and major injuries with a 50% reduction in train accident risk by 2019. We will monitor Network Rail's implementation of its new strategy.

3.84 Network Rail has said it will use RM3 along with other measures to determine the success of its safety and wellbeing strategy, but has not explained what other measures it will use. We will continue to use RM3 as an enabler as the information used by the model is generated through our inspection work.

3.85 More generally we will continue to monitor and inspect Network Rail's health and safety performance and where necessary use our regulatory tools to secure legal compliance and continuous improvement. We expect Network Rail to develop measures to show how it is improving its management of health risks.

Our decisions on network availability

3.86 In CP4 we set outputs for passenger and freight disruption using the PDI-P and PDI-F measures. For CP5 we needed to decide if network availability outputs should be set, and what the levels of the outputs should be.

3.87 In our outputs consultation we said we thought it is essential that there continue to be obligations on Network Rail to reduce disruption to passengers and freight from engineering work. We noted the potential development of a new metric but, given a lack of industry consensus, proposed to continue setting PDI-P and PDI-F as the output. Network Rail agreed with this approach in its consultation response.

3.88 In their review of CP4 regulated outputs, Arup said PDI-P and PDI-F are difficult to understand and very few people can articulate the calculation process. They also said few people understand how their actions impact on the results, or indeed if it is driving the right behaviours. Network Rail is working with the industry to develop an alternative measure based on working timetable (WTT) compliance. Network Rail is proposing to measure network availability using the WTT compliance measure in 2013-14 (in parallel with PDI-P and PDI-F), with a view to replacing PDI-P and PDI-F early in CP5. Arup (in their role as independent reporter) reviewed the accuracy and reliability of the new WTT measure. They concluded that while the measure is more transparent than the PDI metrics, it needs further explanation and development to determine its accuracy in different scenarios.

3.89 Network Rail's CP5 exit forecasts for PDI-P and PDI-F would represent the lowest levels of disruption from possessions since the measures were established. The

profile of the network availability indices proposed by Network Rail has been based on likely spend rather than specific plans. The methodology has been reviewed and validated by independent reporters[85]. In the course of our expenditure review of enhancements and renewals we made a number of adjustments, including the Electric Spine and Waterloo projects. This will affect the exit forecasts.

3.90 Network Rail already produces supporting information to the PDIs, including an industry four-weekly Possession Indicator Report containing supporting and diagnostic metrics such as the volume of bus replacement of train services, advanced notice of possession and overruns, and use of single line working.

3.91 Despite the concerns around the complexity of PDI measures they appear to have delivered their objectives. Disruption to passengers and freight has reduced, as a result of initiatives such as multiple worksites in single possessions and enhancement of diversionary routes. Passengers have also seen a reduction in rail replacement bus hours throughout CP4. Also, despite much discussion of alternative measures no robust alternative has been put forward. Given the direct impact on passengers and freight customers, we have decided to retain PDI-P and PDI-F as outputs, and set CP5 exit outputs for both measures. Network Rail's forecasts are reasonable given the enhancements and renewals planned for CP5, and we are setting outputs at these levels: CP5 exit for PDI-P of 0.539 and a PDI-F of 0.593 (equivalent to a 14% reduction in passenger disruption and a 33% reduction in freight disruption, between 2014-2019, based on Network Rail's forecast CP4 exit). In their response to this draft determination, Network Rail must confirm (by 4 September 2013) if these forecasts have changed in light of our decisions on enhancements and renewals. We will confirm whether any such changes alter the CP5 outputs, in our final determination. Annual forecasts should be agreed between Network Rail and the industry.

3.92 We will encourage the industry to work together on a new WTT metric to run alongside PDI-P and PDI-F during CP5 with a view to changing in CP6. Network Rail will publish the Possession Indicator Report to give greater transparency around possessions and to help identify any potentially adverse trends that might be encouraged by transfer to a new metric.

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[85] *Review of Network Availability Alternative Metrics*, Arup, February 2013, is available at http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

Our decisions on network capability

3.93 We needed to decide how to protect the baseline capability of the network and reflect future enhancements in network capability monitoring.

3.94 In our outputs consultation we said a network capability output is required to provide a minimum level of capability so that Network Rail cannot reduce capability without going through industry processes. Network Rail agreed with this approach in its consultation response.

3.95 The baseline capability of the network will be that in place as at 1 April 2014. This will be described in Network Rail's Sectional Appendices[86], Geographic and Infrastructure System (GEOGIS) Database[87] and National Gauging Database[88].

3.96 Together, these sources must describe the capability of the network in terms of track mileage and layout, line speed, gauge, route availability and electrification type / mileage.

3.97 We require Network Rail to transparently publish all changes to the baseline network capability and update its documentation. Network capability must then be maintained at this level, unless the specification is altered through the industry network change procedure (for example in connection with enhancement projects to deliver increased capacity). This aligns with Arup's review of CP4 regulated outputs, which said that while the outputs of track mileage and layout, linespeed, gauge, route availability and electrified track capability have not changed much nationally, they are nevertheless useful measures to ensure capability does not deteriorate.

3.98 Network Rail must ensure that during and following the devolution of some management decisions to route level, the collection and provision of capability data are maintained on a consistent and timely basis across all routes and network headquarters.

3.99 We will publish an annual summary of capability changes.

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[86] Network Rail publishes a Sectional Appendix for each route that are current statements of the operational performance of the network, including changes to the baseline.

[87] Geogis is a database maintained by Network Rail containing information on the location of track, buildings and structures.

[88] National Gauging Database is a database maintained by Network Rail containing gauge clearance of rail traffic in Great Britain.

Our decisions on stations and depots

3.100 In CP4, station condition is an output and is measured with the SSM. We needed to decide whether to set station condition as an output in CP5 and whether to continue with SSM as the measure. In CP4 depot condition is monitored using the Light Maintenance Depot Stewardship Measure (LMDSM), but is not an output. We needed to decide whether to continue monitoring depot condition using the LMDSM.

3.101 Stations in England & Wales are classified in six categories[89] and outputs are set for each category along with an aggregated output for Scotland. SSM is calculated by assessing the asset remaining life (how long an element is expected to last at the point of inspection) of key elements against the asset life expectancy (how long an element is expected to last when first made).

3.102 In our outputs consultation we said we will continue with the existing SSM as an output and migrate to the new SSM+[90] if agreed with Network Rail. In its response, Network Rail said it believed SSM should be an indicator, reflecting the changing ownership of stations and the fact that it is only one component of the station environment that influences customer experience.

3.103 SSM has been reviewed by the Part A independent reporters for data assurance (Arup) three times in CP4. Data quality has improved from a C4[91] (significant shortcomings in the system and data is accurate to 25%) to a B2 (minor shortcomings in the system and data is accurate to 5%), but is still below our A1 (system is reliable and data is accurate to 1%) data quality expectation. We expect SSM to achieve A1 data quality by April 2017 (see Table 3.8).

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[89] The Department for Transport categorises stations into National Hub (category A), Regional Interchange (category B), Important Feeder (category C), Medium Staffed (category D),Small Staffed (category E) and Small Unstaffed (category F).

[90] SSM+ provides a clearer disaggregation for measuring condition and better, value based, weights using Modern Equivalent Asset Value as the weighting applied to the condition of station components (to replace the current weighting). It also defines the disaggregation at which the condition assessment should take place.

[91] The independent reporter for data assurance (Arup) assesses the reliability of data on a scale of A (appropriate, auditable, properly documented, well-defined and written records, reporting arrangements, procedures, investigations and analysis shall be maintained, and consistently applied across Network Rail) to D (as A, but with some highly significant shortcomings in the system), and accuracy on a scale of 1* (data used to calculate the measure is accurate to within 0.1%) to X (data cannot be measured).

3.104 In our outputs consultation we said we would not set LMDSM as an output, but would monitor it as an indicator, reflecting the supporting role depots play in delivery of other outputs.

3.105 LMDSM is calculated in the same way as SSM – the asset remaining life of a range of elements is compared to asset life expectancy. As with SSM, data quality of LMDSM was reviewed three times in CP4. Data quality improved from a C5 (significant shortcomings in the system and data is accurate to 50%) to a C2 (significant shortcomings in the system and data is accurate to 5%), but is still well below our A1 data quality expectation. We expect LMDSM to achieve A1 data quality by April 2017 (see Table 3.8).

3.106 Stations are a key passenger interface, and a determinant of passenger satisfaction on the railway. Station condition is also a potential safety concern and poorly maintained stations can present a risk to passengers. We therefore view station condition as very important and have decided to retain SSM as a regulated output in CP5. We require Network Rail to maintain station condition at anticipated CP4 exit levels[92] and achieve the SSM figures they have provided to ORR (see Table 3.5 below) in their SBP clarifications.

Table 3.5: Annual Station Stewardship Measure outputs for CP5

Station Stewardship Measure	2014-15	2015-16	2016-17	2017-18	2018-19
Category A (England & Wales)	2.24	2.24	2.24	2.23	2.23
Category B (England & Wales)	2.34	2.33	2.33	2.33	2.32
Category C (England & Wales)	2.40	2.40	2.39	2.39	2.38
Category D (England & Wales)	2.40	2.39	2.39	2.38	2.38
Category E (England & Wales)	2.40	2.40	2.39	2.39	2.39
Category F (England & Wales)	2.48	2.47	2.47	2.46	2.46
Scotland	2.33	2.33	2.33	2.32	2.32

3.107 We have decided that LMDSM should continue to be an indicator in CP5. It will be monitored as an asset condition measure (see Table 3.10).

[92] A lower SSM score indicates a better station condition.

Our decisions on asset management

3.108 In our outputs consultation we noted that, although Network Rail's management of its assets had improved, the pace of change had not been fast enough. Network Rail's SBP submission clearly shows that the position is uneven, varying across the assets, and we have regularly set out our concerns about problems in particular geographical areas. Recent data casts doubt on Network Rail's delivery of its own plans.

3.109 Although we support the move to a more devolved structure, it also raises new challenges. The new route directors for asset management will be integrated with the maintenance delivery organisation, providing a sharper focus on targeting the management of the assets on delivering the operational railway at the route level. But asset management capability is unlikely to be fully embedded at the route level yet, and it will take some time for the structure to evolve, as the central organisation focuses on providing more of a specification and assurance role.

3.110 Our consultation said that we needed to be able to measure Network Rail's progress in terms of:

(a) asset management capability;

(b) data quality;

(c) the delivery of the ORBIS programme;

(d) asset condition;

(e) asset performance; and

(f) the delivery of its assets policies in terms of volumes of work.

3.111 We said that we were considering setting the first three areas as outputs in order to drive faster improvement.

3.112 We were disappointed that Network Rail's SBP response on asset management did not fully address the concerns we had raised in our outputs consultation, the ongoing concerns we had raised about delivery, or provide assurance on how the relationship between the central organisation and the routes will work.

3.113 Excellent asset management is a critical pre-cursor to a high performing, efficient and safe railway. We have decided that to secure the improvements that we consider are needed (and Network Rail also says are needed) we now need to set asset management outputs in line with our consultation proposal.

Asset management capability

3.114 The quality of Network Rail's asset management capability is a key determinant of its performance and efficiency both during the control period and in the longer term. The independent reporter (AMCL) carries out regular assessments of Network Rail's maturity against its Asset Management Excellence Model (AMEM, see Table 3.6 below). This model currently has 23 activities that are split into six core groups with each given a score from 0 to 100. A score of over 70 is needed to be in the excellent category.

3.115 Network Rail and ORR jointly agreed trajectories for CP4 in order for Network Rail to meet its commitment of best practice. AMCL's latest assessment[93] has shown that while Network Rail has made progress, it only met two of the six targets as at January 2013. This reinforces our view about the slow pace of progress by Network Rail.

Table 3.6: Asset Management Excellence Model – Network Rail's capability progress in CP4

Core Groups	Network Rail as assessed 2009	AMCL Roadmap Target for SBP	Network Rail as assessed at SBP
1 - Asset Management Strategy & Planning	56.3%	64.7%	65.8%
2 - Asset Management Decision-Making	47.3%	59.7%	58.7%
3 - Lifecycle Delivery Activities	64.8%	70.5%	69.2%
4 - Asset Knowledge Enablers	51.7%	63.5%	60.7%
5 - Organisation & People Enablers	63.0%	71.1%	67.3%
6 - Risk & Review	49.5%	58.1%	60.8%

3.116 During CP5 we expect Network Rail to make sufficient progress in asset management maturity that the renewals and maintenance parts of its SBP for CP6 are based on a bottom-up workbank for the whole of CP6, created by applying its asset policies to all assets in all asset groups, in accordance with good asset management practice, and condition 1.19 of the Network Licence. To help ensure Network Rail's SBP for CP6

[93] *2013 SBP AMEM Assessment*, AMCL, May 2013, is available at http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

meets our expectations, we have decided to set outputs for the asset management excellence scores, one for each of the six core groups, which should be achieved by the time of the CP6 SBP submission, in year four of CP5.

3.117 We expect Network Rail to continue to improve its asset management capability after its CP6 SBP submission, so we have also set outputs for the end of CP5.

3.118 The outputs are shown in Table 3.7. They are based on AMCL's projection of Network Rail's maturity in asset management taking into account the progress it is expected to make by the start of CP5.

Table 3.7: Our decisions on CP5 capability outputs

Core Groups	Assumed Entry CP5 (March 2014)	Output for CP6 SBP Baseline (January 2018)	Output for End CP5 (March 2019)
1 - Asset Management Strategy & Planning	67%	73%	75%
2 - Asset Management Decision-Making	64%	70%	73%
3 - Lifecycle Delivery Activities	70%	74%	75%
4 - Asset Knowledge Enablers	68%	75%	77%
5 - Organisation & People Enablers	73%	75%	76%
6 - Risk & Review	63%	70%	72%

3.119 Network Rail intends to measure capability not just at the company wide level but at the route level where asset management decisions will increasingly be taken. Not all of the AMEM can be readily applied at route level because part of an organisation's score is based on the maturity of its policy and strategy documents, which are held at head office level, rather than at a route level. We will work with Network Rail to help develop an asset management capability 'lite' indicator, to monitor progress at route level. This will be in place for our final determination.

Asset data quality

3.120 Asset management is only as good as the data on which it is based. As our analysis in the maintenance and renewals chapter shows, poor data reduces the quality and value of Network Rail's SBP plans for maintenance and renewals.

3.121 We already have a standard method for assessing asset data quality based on confidence grading of data reliability (the process or 'governance' for producing the data: A to D scale) and a grading of accuracy and completeness (1* to 6).

3.122 We have decided to set national data quality outputs by asset. Network Rail cannot be an excellent asset manager without reliable data about all asset types. We therefore require all asset types to be grade A for reliability. The baseline for the outputs will be determined by the recent audit carried out by Arup[94] which provides a grading for each asset type.

3.123 We are setting the outputs (see Table 3.8 below) for improving asset data quality to ensure that Network Rail is in the best place to inform its strategic business plan for CP6, hence Network Rail is required to meet the output levels by April 2017 and at least maintain this level by the end of CP5.

Table 3.8: Our decisions on asset data quality outputs

Asset Data Quality	Asset Data Quality	Asset Data Quality
Asset Groups	**May 2013 ARUP Scores**	**CP6 SBP (April 2017)**
Track		
Plain Line	B3	A2
Switches & Crossings	B3	
Signalling		
Interlockings	A2	A2
Signals	A3	
Train Detection Equipment	A3	
Point Operating Equipment	A3	

[94] *Audit of asset data quality*, Arup, May 2013, is available at http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

Asset Data Quality	Asset Data Quality	Asset Data Quality
Asset Groups	**May 2013 ARUP Scores**	**CP6 SBP (April 2017)**
Level Crossings	A2	
Telecomms	-*	A2
Electrical Power		
High Voltage Switchgear	-*	A2
Transformers	-*	
Overhead Line Equipment	B2	
Conductor Rail	B4	
High Voltage Cables	-*	
Buildings	B1	A1
Structures		
Underline Bridges	B5	A2
Overline Bridges	B5	
Earthworks	-*	A2

*The data quality of these asset types has not been fully assessed at the time of publication.

ORBIS milestones

3.124 The ORBIS programme represents a major investment in asset management by Network Rail. The programme is reasonably well defined and we have been provided a series of specific milestones. Table 3.9 summarises the milestones we will regulate against. The success measure of each milestone will be our approval of each milestone's completion report.

Table 3.9: Our decisions on ORBIS milestone outputs

Milestone	Description	Date
Linear Asset Decisions Support (LADS) National rollout complete	LADS will bring together disparate track data sources to enable Network Rail to target work more efficiently	May 2014
Handheld - Fault and incident data capture app roll-out complete	The new app will enable maintenance staff to enter fault data directly into operational systems from the track, speeding up data capture	August 2014

Milestone	Description	Date
Signalling Decision Support (SDS) National rollout complete	SDS will bring together disparate signalling data sources to enable Network Rail to target work more efficiently	September 2015
Electrification & Plant Decision Support (E&PDS) National rollout complete	E&PDS will bring together disparate Electrification & Plant data sources to enable Network Rail to target work more efficiently	December 2015
Replace CARRs (Civils Asset Register & Reporting system)	Ellipse designated as master system for Civils and CARRS database switched off. Asset hierarchies established for all surveyed structures in Ellipse condition module	June 2016
GEOGIS decommissioned	Disparate data systems will be replaced by an overarching Master Data Management solution	December 2016

3.125 We have decided that the milestones stated in Table 3.9 will be regulated outputs, even though we will already have asset data quality outputs. While ORBIS is largely a data quality improvement initiative, the outcome of the programme is broader, covering process changes to convert data into knowledge, hence we see these outputs as complementing the asset data quality outputs.

Asset Condition and performance indicators

3.126 An excellent asset management company must have the tools to measure its assets at appropriate intervals, to match the predicted residual life and failure modes (why the asset fails in service) and also to be able to store asset condition information.

3.127 We have decided to monitor a suite of asset condition indicators, at the national and route level, to improve our ability to understand how well Network Rail is delivering. The creation of route asset managers for each discipline (for example, track and signalling) as part of devolution, places asset management much closer to both maintenance and renewal delivery and is a move we very much support. We need to adapt our monitoring approach accordingly, although it is for Network Rail to determine how best to manage its routes and other business units. We see a strong read across to other parts of our output framework – for example understanding whether higher performance could be delivered at an individual TOC level may depend on asset performance at the route level.

3.128 We have developed a series of proposed measures of condition (sustainability) and performance (robustness) with Network Rail. The measures which we will monitor as indicators are defined in Table 3.10 below. Network Rail will publish these indicators in the delivery plan.

Table 3.10: Asset condition indicators for CP5

	Robustness (Periodic)		Sustainability (Annual)	
Asset discipline	**Measure**	**Broken down by**	**Measure**	**Broken down by**
Track	Number of broken rails	Route	Track - Used Life - Rail	Route
	Plain Line Track geometry	Route	Track - Used Life – Switches & Crossings	Route
	Track failures (service affecting)	Route	Track - Used Life - Sleepers	Route
			Track - Used Life - Ballast	Route
Signalling	Signal failures (service affecting)	Route	Signalling Condition Index (Signalling Infrastructure Condition Assessment Remaining Life)	Route
Telecoms	Telecoms failures (service affecting)	Route	Telecoms - Remaining Life	Route
Electrical Power	Alternating Current traction power failures (service affecting)	Route	Electrification & Plant (E&P) - Remaining Life - Conductor Rail	Route
	Direct Current traction power failures (service affecting)	Route	E&P - Remaining Life – Overhead Line Equipment	Route
	Non traction operational power supply failures (service affecting)	Route	E&P - Remaining Life - Signalling Power Cable	Route

	Robustness (Periodic)		Sustainability (Annual)	
Asset discipline	**Measure**	**Broken down by**	**Measure**	**Broken down by**
Buildings	Reactive faults (requiring repair with 2 or 24 hours)	Route	Percentage Asset Remaining Life - Stations	Route
			Percentage Asset Remaining Life – Light Maintenance Depots	Route
Structures	Number of open faults with a risk score ≥20	Route	Structures – Primary Loadbearing Element Condition Banding	Route
			Tunnel Condition Monitoring Index	Route
Earthworks	Earthwork failures	Route	Earthworks - Condition Banding	Route
Drainage	None		Track Drainage - Condition Banding	Route
			Earthwork/Structure Drainage - Condition Banding	Route
Points	Points failures (service affecting)	Route	None	
On Track Plant	To be determined (Based on Availability)	National	None	

Volume indicators

3.129 The licence requires Network Rail to present asset policies that show how maintenance and renewals will be prioritised (i.e. where and in what order it will be done) and explain engineering / technology choices. We have assessed the policies through challenge by our own engineers and expert reporters. But we have not dictated any aspect of policy detail.

3.130 We consider that the policies have passed our robustness and sustainability tests, to establish that they will continue to work in the long-term, without causing maintenance and renewals backlog (see maintenance and renewals chapter 8).

3.131 Network Rail has used its models to turn the policies into a series of activity volumes, to be published (e.g. in its delivery plan), which profiles the work over the prospective five year control period. We do not set the required volumes or drive Network Rail to carry out renewals on less busy routes to meet volume or unit rate targets. The priority for individual renewals comes from Network Rail's whole life cost models for each asset group, which it uses to define the work required to meet asset condition targets.

3.132 We are primarily interested in Network Rail's delivery of outputs across the control period and long-term sustainability. We will monitor the maintenance and renewals volumes included in Network Rail's delivery plan, as it is clear from CP4 that there is a correlation between operational performance and volumes of activities such as tamping. We will expect Network Rail's delivery plan to be in line with its asset policies. Network Rail will need to provide us with a justification for any material divergences between the actual volumes delivered in a year and those forecast in the delivery plan and we will monitor this on a forward looking basis (i.e. whether the volumes are likely to be delivered). Taken at a route level these measures will help inform our decisions on the future deliverability of TOC level JPIP performance outputs.

Decisions on the environment

3.133 The HLOSs made it clear that the Secretary of State and Scottish Ministers expect Network Rail to manage the network with minimum impact on the environment. The Secretary of State's HLOS said the industry should set itself carbon and energy efficiency objectives. The Scottish Minister's HLOS seeks a continuous and sustained carbon reduction. We needed to decide how we will measure Network Rail's performance in this area, while avoiding any potential dual regulation (see paragraph 3.138 below).

3.134 In April 2013 the industry-wide Sustainable Rail Programme published its Meeting Rail's Carbon Ambition plan. The plan acknowledges the need to reduce operational and embedded carbon, develop a whole life carbon measurement tool and robustly measure emissions. The plan includes a number of industry-wide actions that will translate to an absolute reduction in traction CO2 emissions of 12% by the end of CP5.

3.135 A number of Network Rail's plans will have positive environmental benefits. The electrification programme will reduce carbon emissions, and elsewhere in PR13 we are setting incentives to reduce transmission losses for electricity used by rolling stock and to encourage consumption to be metered.

3.136 Network Rail produced carbon emission and intensity forecasts in the SBP and we (jointly with Network Rail) commissioned the independent reporter (Arup) to validate the accuracy and reliability of the forecasts. Arup concluded[95] that there was scope for improving the process for producing these forecasts.

3.137 In our outputs consultation we stated that we do not propose to set any environmental outputs for Network Rail in CP5. In their review of CP4 regulated outputs, Arup questioned the value of environmental outputs, given the relative immaturity of the measures. There are also existing environmental and legal obligations on Network Rail[96] and many of Network Rail's sustainable development activities are regulated by others.

3.138 While we are not setting environmental outputs for CP5, we do want to know – and we expect Network Rail to want to know – whether the company is setting itself ambitious and stretching targets. The Secretary of State's HLOS stated the "industry should also set out plans for embedding the rail industry's Sustainable Development Principles[97] and measuring and reducing the carbon embedded in new infrastructure, throughout the lifecycle of programmes and projects. This should include the use of a suitable carbon accounting methodology". We will monitor Network Rail's asset policies and programme / project planning, to ensure this requirement is met.

3.139 Network Rail plans to forecast and report on the following indicators in CP5:

(a) Scope 1 and 2 carbon dioxide emissions associated with Network Rail's own operations (traction, non-traction and total);

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[95] *Review of Network Rail's carbon reduction calculations and CP5 trajectory*, Arup, May 2013, is available at http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

[96] Network Rail is required to report environmental incidents, and events of non-compliance with environmental permits, to the Environment Agency and Scottish Environment Protection Agency. Network Rail is also required to report the condition of Sites of Special Scientific Interest (that it owns) to Natural England, Scottish Natural Heritage and Countryside Council of Wales, and its carbon footprint via the Carbon Reduction Commitment, to Department for Energy and Climate Change.

[97] *The Rail Industry Sustainable Development Principles*, RSSB, February 2009, are available at http://www.rssb.co.uk/SiteCollectionDocuments/national_programmes/sustainable_rail/Rail Industry Sustainable Development Principles.pdf.

(b) carbon and energy efficiency KPIs;

(c) carbon embedded in new infrastructure reporting; and

(d) sustainable development KPIs (to be detailed in the CP5 delivery plan).

3.140 There will be independent assurance of these indicators, to ensure Network Rail's environmental reporting is relevant, accurate and reliable.

3.141 We expect Network Rail to address the recommendations in Arup's report before the revised carbon emission and intensity forecasts are published in its delivery plan. Network Rail's carbon reduction forecasts must also support the industry's goal of an absolute reduction in traction CO2 emissions of 12% by the end of CP5, and a reduction in carbon embedded in new infrastructure.

3.142 It is also vital that railway infrastructure is resilient to climate change and extreme weather. However, our assessment is that Network Rail does not have robust climate change resilience plans. We therefore require Network Rail to provide further evidence (in its delivery plan) of how its assets are resilient to climate change and extreme weather.

3.143 In 2010 the Secretary of State for Environment, Food and Rural Affairs published his Noise Action Plan addressing noise management issues under the terms of the Environmental Noise (England) Regulations 2006. The action plan identified ORR and DfT as the rail authorities required to implement any actions or secure budget for actions. We will work with the DfT and Network Rail to discharge our responsibilities, when the latest noise mapping data is available.

Decisions on other areas

System operator capability

3.144 Good system operation is about achieving the most efficient or 'best' provision and use of the network. This is broader than efficiency in capacity management. It is ultimately about successfully balancing competing customer needs. The importance of good system operation will continue to increase in a world where there is increasing and competing demand for use of an already constrained network.

3.145 We have established four principles for good system operation with Network Rail which are essentially a statement of why it matters. Basically a high performing system operator should achieve:

(a) fair treatment – ensuring that competing demands for access to the network (including from Network Rail itself e.g. to carry out engineering works and to manage performance risk) are treated fairly is an essential characteristic of a high performing system operator. We recognise that there is a risk that alliancing and more bespoke arrangements between Network Rail and TOCs could increase Network Rail's ability and incentive to discriminate between those with competing demands for access to the network;

(b) coordination, network benefits and value – demand for access from many operators, demand for access from Network Rail and demand for access from operators across devolved routes all have to be reconciled. Planning horizons are long and assets are long lived – long-term planning is critical;

(c) transparency – dissemination of information about availability and quality of network identifies where network constraints exist and 'what/where/how' action should be taken efficiently to address them; and

(d) modal reach and integration – as well as internal coordination good system operation covers the smooth and efficient operation of interfaces with adjoining infrastructure within rail e.g. London Underground Limited, High Speed 1 (HS1) and freight terminals, and should also support efficient integration with other transport modes.

3.146 We have taken these principles as a starting point and attempted to define short, medium and long-run system operator functions. We have then attempted to identify possible corresponding measures of performance of these functions.

3.147 In our August 2012 outputs consultation we acknowledged that good system operation is multifaceted and that measuring it would require consideration of the performance of multiple functions. These include timetabling, possessions planning, understanding capacity availability and utilisation, network planning and network change.

3.148 We have so far developed a 'long list' of measures of a range of functions which we are working to rationalise in to a 'short list'. We are applying a common framework to think about the relevance and usefulness of the measures in the long list. This is in the form of a common statement of the characteristics of good measures.

3.149 Our expectation is that the final short list of system operator performance measures will take the form of a dashboard containing a range of indicators. The dashboard should be sufficiently comprehensive without being unduly complex and allow the system operator the opportunity to trade-off between the various indicators, where appropriate, while achieving a good level of performance overall. It will be important that the measures:

(a) reflect factors which the system operator can directly influence or do something about;

(b) are based on existing and readily available data where possible, minimising the need for creation of new measures;

(c) have a value which is readily understood – and preferably one that can be expressed in a common currency e.g. £s; and

(d) reflect value to the full set of stakeholders including Network Rail's customers and its funders.

3.150 We expect that an illustrative dashboard will be drawn up and agreed between Network Rail and ourselves in time for inclusion in the final determination. The dashboard will measure Network Rail's system operator performance, which will be an enabler in CP5. The exact content of the dashboard will be consulted on by Network Rail as part of its December 2013 draft delivery plan. We will expect Network Rail to publish its performance against the measures on an annual basis throughout CP5. Once we have a track record of data we will consider whether the dashboard needs to be refined, to ensure it accurately measures Network Rail's system operator progress.

3.151 Our ultimate aim is to establish, in the course of CP5, whether we need to develop specific incentives to drive improvements in performance in aspects of the system operator functions.

Programme management capability

3.152 In our outputs consultation we stated that Network Rail needs to monitor its own capability in programme and project management. We also said we expect Network Rail to propose a framework for each of these areas by which we can also monitor its progress. We are working with Network Rail to agree a way in which it can assess its progress.

3.153 We have commissioned the independent reporter Nichols to provide constructive challenge to Network Rail in its assessment of how best to achieve external assessment and accreditation of its programme and project management.

3.154 We have therefore decided to include an enabler that measures Network Rail's effectiveness in programme and project management capability. We will confirm the metric in our final determination.

Customer service maturity

3.155 We needed to decide whether Network Rail's customer service maturity should be an enabler in CP5 and whether it should set a trajectory for its level of maturity through CP5.

3.156 Network Rail has been measuring the satisfaction of its passenger and freight operator customers through its annual survey throughout CP4. The survey gives a good guide but does not allow Network Rail to understand if it is a genuinely customer-focused organisation.

3.157 Network Rail has been developing an appropriate model for measuring its overall level of customer service maturity in CP5. It committed to establishing a trajectory for its customer service maturity in its SBP. We support this approach and believe that the model that it is developing will provide a much fuller picture of the level of service delivered to its customers than its annual survey alone. However, the SBP did not specify any detail as to how it proposed to do this.

3.158 We have been monitoring progress of Network Rail's work to establish the trajectory. Network Rail has appointed KPMG to work with it to identify, develop and implement an appropriate model and establish a trajectory for the end of CP5.

3.159 Network Rail needs to develop a clear roadmap for establishment of an appropriate model. Network Rail has committed to consulting the industry on its proposed metric and action plan for implementing the model. The results of its consultation will be critical and we will need to ensure that Network Rail responds positively to feedback received and uses it to develop a model for implementation.

3.160 We require Network Rail to develop a customer service maturity model, with trajectories and action plan. Network Rail will use the model to baseline performance as of 1 April 2014, and the model will be an enabler for excellent customer service maturity throughout CP5.

Passenger satisfaction

3.161 We are focused on improving the passenger experience. Supporting a better service for passengers is a key corporate objective for ORR and a priority for the wider rail industry.

3.162 The National Passenger Survey (NPS, Passenger Focus) provides biannual passenger satisfaction results for the rail industry. We monitor it to assess progress in the passenger experience across the network.

3.163 We have included the NPS as an indicator in our output framework. This will support continuous improvement in service and raise awareness of our passenger role.

Journey time

3.164 We needed to decide if a process is required to establish a metric to measure journey time.

3.165 The Secretary of State and Scottish Ministers' HLOSs both acknowledge the importance of reducing journey times. There are several initiatives planned for CP5 (including the Edinburgh to Glasgow Improvements Programme and investments in the Great Western, East Coast and Midland Main Lines) that will cut journey times across borders, and between key cities.

3.166 In our outputs consultations we said it is important that performance improvements must not be achieved at the expense of journey times. We acknowledged that developing a metric would be challenging, but nevertheless advantageous given the funds committed to journey time reduction. In its response, Network Rail said a journey time indicator would be complex, but a metric linked to improvement funds could be considered. We will work with the industry and funders to develop a journey time metric.

3.167 Transport Scotland also emphasised that a process needed to be established so that Network Rail takes advantage of opportunities to reduce journey times, for example when carrying out renewals work. We will monitor Network Rail's progress in this area.

Cross-border service availability

3.168 We needed to decide if there should be a requirement on Network Rail to make at least one cross-border (between England and Scotland) route available at all times.

3.169 The Scottish Ministers' HLOS said "Cross border rail services provide vital connections for passengers, key routes to market for freight users and contribute to regional economic development, including within Scotland. In support of this, the Scottish Ministers require that where maintenance, renewal or enhancement activity is required on cross border routes, at least one of those routes will be planned to be available at all times for the passage of timetabled sleeper, passenger and freight services through to London without the need for change."

3.170 This requirement spans both England and Scotland and the Secretary of State did not specify a similar requirement. It is not clear what costs would be involved in providing a total guarantee one route would always be open. Network Rail's SBP acknowledges the importance of the requirement, but highlights potential difficulties on certain dates, such as English Bank Holidays.

3.171 We have decided that the availability of a cross-border route (as described in the Scottish Ministers' HLOS) will be an indicator. Network Rail must use all reasonable endeavours to keep at least one cross-border route open at all times, but we recognise that this may not always be possible. We will review this requirement throughout CP5 and discuss with Transport Scotland, DfT, and Network Rail.

Change control

3.172 In CP4 we have a change control mechanism for enhancements. This has worked well and (for example) allowed us – in consultation with the industry - to adjust enhancement programmes when the scope or requirements has changed.

3.173 Network Rail has proposed that a broader mechanism is introduced to allow other outputs to be changed in one specific circumstance – where the DfT or Transport Scotland specifies franchises in a way which is materially inconsistent with Network Rail's outputs.

3.174 We agree this is sensible and allows the regulatory settlement and franchising to be more joined-up. We have therefore decided to, in principle, introduce a change control mechanism for performance outputs, on the terms outlined above.

3.175 Any change to a regulated output will involve consultation with affected parties. We will make the final decision on change control requests. We will be discussing this further with government and Network Rail, to define the details of the change control mechanism and provide further guidance to all parties.

CP5 output framework

3.176 This chapter confirms the decisions we have taken on outputs, indicators and enablers. It presents our analysis of HLOS requirements, Network Rail's SBP, independent reporter studies and consultation feedback. We have considered all of these in specifying our output framework, which is summarised below in Table 3.11.

Table 3.11: Our decisions on the CP5 output framework

Area	Outputs	Indicators	Enablers (these support all output areas)
Train service reliability	• PPM: for England & Wales (annual with a CP5 exit of 92.5%), Scotland (annual 92% and CP5 exit of 92.5%) and franchised TOCs in England & Wales (rolling annual outputs with no TOC to exit CP5 below 90%) • CaSL (England & Wales annual and CP5 exit of 2.2%) • Freight Delivery Metric (National annual 92.5%)	• PPM: sector and service group • Right-time performance: England & Wales, Scotland, sector, JPIP and service group • Average lateness: England & Wales, Scotland, sector and JPIP • CaSL: sector and service group • Delay minutes, split by category (including Network Rail on TOC, TOC on self and TOC on TOC): for National, England & Wales, Scotland, sector, Network Rail route and JPIP • Freight delay minutes, national and strategic freight corridor • Scotland KPI package	• Safety management maturity (Railway Management Maturity Model) • System operator capability • Programme management capability • Customer service maturity
Enhancements	• Enhancement scheme delivery milestones (set in an enhancements delivery plan) • Development milestones for early stage projects	• Enhancement fund KPIs (e.g. average scheme benefit cost ratios) • Improved governance processes for HLOS funds • Project activities and milestones	

Area	Outputs	Indicators	Enablers (these support all output areas)
Health and safety	• A plan of projects in CP5, to achieve the maximum possible reduction in risk of accidents at level crossings using the £67m ring-fenced fund		
Network availability	• PDI-P (National CP5 exit of 0.539) • PDI-F (National CP5 exit of 0.593)		
Network capability	• Base requirement at start of CP5 in terms of track mileage & layout, line speed, gauge, route availability, electrification type		
Stations	• SSM by station category, and Scotland (annual)		
Depots		• Light Maintenance Depot Stewardship Measure: England & Wales, Scotland and National	
Asset management	• Asset management excellence (AMEM) capability for each core group at National level • Asset data quality for each asset type at National level • Milestones for ORBIS	• Asset condition for robustness and sustainability at National and route level • AMEM lite capability by core group at route level • Renewal and maintenance volumes by asset type and spend at National and route level	

Area	Outputs	Indicators	Enablers (these support all output areas)
Environment		• Scope 1 and 2 traction and non-traction carbon dioxide emissions: England & Wales and Scotland • Carbon intensity: England & Wales and Scotland • Carbon embedded in new infrastructure • Sustainable development KPIs	
Other		• Passenger satisfaction • Journey time • Cross-border service availability	

Main differences compared to PR08

3.177 Table 3.12 below summarises the main changes in each output area from CP4.

Table 3.12: Summary of differences between CP4 and CP5 output framework

Area	Outputs	Indicators	Enablers (these support all output areas)
Train service reliability	PPM: industry sets TOC level outputs via JPIPs and franchised TOC CP5 exit output Freight: delay minutes measure replaced with Freight Delivery Metric		New safety enabler (Railway Management Maturity Model) New system operator capability enabler New programme management capability enabler New Customer service maturity enabler
Enhancements	New approach for regulating early stages schemes		
Health and safety	New level crossing risk reduction plan output (England & Wales and Scotland)		

Area	Outputs	Indicators	Enablers (these support all output areas)
Network availability (reducing disruption from engineering works)	Potential new (working timetable compliance) measure to run in parallel to PDI-P and PDI-F		
Stations	Potential new (SSM+) measure		
Depots		Light Maintenance Depot Stewardship Measure monitored as part of asset condition suite of indicators	
Asset management	New national capability output (AMEM) New data quality output (confidence grades) New ORBIS output	New asset condition indicators for robustness and sustainability New route capability indicator (AMEM lite) Renewal and maintenance volumes by asset type and spend at National and route level	
Environment		New indicators for carbon dioxide emissions and carbon intensity	
Other		New Passenger satisfaction (National Passenger Satisfaction Survey) indicator New journey time indicator New cross-border route availability indicator	

Next steps

3.178 We will publish our final decisions on the outputs framework in October as part of our final determination. But a number of detailed issues will then need to be completed as part of a wider industry process.

3.179 Most notably Network Rail will need to agree the two year JPIPs with the industry and it will need to agree milestones for its enhancement projects (including completion dates for projects that are well advanced and development milestones for projects at an early stage of development).

3.180 It will publish its plans in draft in its draft delivery plan in December 2013. The final delivery plan will be published in March 2014 following consultation and after our approval.

4. Overview of efficient expenditure

Key messages in this chapter

- Our assumptions on how much money Network Rail needs to spend to deliver its outputs and other commitments are fundamental to our decisions on the company's revenue requirement.
- We have thoroughly reviewed Network Rail's plans across all areas of expenditure to ensure that our assessment is challenging but achievable.
- We have reviewed cross cutting issues such as the management of inflation, which potentially apply to all areas of spend, and issues specific to certain types of spend.
- In maintenance and renewals our assumptions cover the assumed 'pre-efficient' level of spend (which reflect volumes of work and the unit cost of doing this work today) and efficiency assumptions applied to the pre-efficient spend.
- We have set Network Rail a CP5 efficiency challenge on its support, operations, maintenance and renewals costs of 19.6%.
- Our assessment should incentivise Network Rail to reduce its costs in a safe and sustainable way.

Structure of chapter

4.1 This chapter is structured as follows:

(a) introduction to the chapter;

(b) CP4 experience;

(c) approach to our PR13 assessment;

(d) cross-cutting issues;

(e) efficient expenditure assumptions; and

(f) overview of efficiency assumptions.

Introduction

4.2 Assessing the level of efficient support, operating, maintenance, industry costs and rates, renewals and enhancement expenditure that Network Rail needs to deliver its required outputs in CP5, and sustain asset condition for the longer term, is a core part

of our work on PR13. The assumptions we make on the level of efficient expenditure are fundamentally important to our determination of the company's overall revenue requirement.

4.3 The RVfM study set a clear challenge for the industry to reduce its costs. It assumed that Network Rail could deliver between approximately 50% - 75% of the industry savings identified for CP5. Annex G sets outs how our PR13 assumptions compare to the RVfM study findings.

4.4 In our advice to ministers, we set out our assumed savings that Network Rail could make as a range. Our determination is based on more detailed evidence and hence supersedes those estimates.

4.5 Our determination for CP5 provides strong incentives on Network Rail to strive for continuous and sustained improvements in efficiency, building on the improvements in efficiency it has made in CP3 and CP4. Our judgements on the level of efficiency that we consider is challenging but achievable, and indeed could potentially be exceeded without compromising delivery of outputs (including health and safety), are an essential part of this.

4.6 We set out in detail how we reached our assumptions on each expenditure area in the rest of the document. In this chapter we summarise how we approached our assessment.

CP4 experience

4.7 In our PR08 determination for Network Rail we set Network Rail's total support, operating, maintenance and renewals expenditure at £23,380m (2012-13 prices).

4.8 The efficiency assumptions were to reduce its support, operating, maintenance and renewals costs by 21% by the end of CP4 (i.e. the end of 2013-14). Table 4.1 sets out our annual PR08 efficiency assumptions.

Table 4.1: Our PR08 efficiency assumptions

	2009-10	2010-11	2011-12	2012-13	2013-14
Support and operations					
Net efficiency	2.8%	2.8%	4.0%	4.0%	4.0%
Cumulative net efficiency	2.8%	5.5%	9.3%	12.9%	16.4%
Maintenance					
Net efficiency	3.2%	3.2%	4.0%	4.5%	4.5%
Cumulative net efficiency	3.2%	6.3%	10.1%	14.1%	18.0%
Renewals					
Net efficiency	5.0%	5.0%	5.5%	5.5%	5.5%
Cumulative net efficiency	5.0%	9.8%	14.7%	19.4%	23.8%
Total					
Net efficiency	4.2%	4.1%	4.7%	4.9%	4.9%
Cumulative net efficiency	4.2%	8.2%	12.5%	16.8%	21.0%

4.9 Network Rail's PR13 SBP forecast level of efficiency is three percentage points below its original target that would have delivered our PR08 determination. This is likely to mean that on a PR08 basis its efficiency improvement in CP4 will be 18%.

4.10 Our assessment of Network Rail's efficient expenditure in CP5, and hence the efficiency savings that we expect Network Rail to achieve in CP5, assume Network Rail delivers its SBP forecast of its efficiencies at the end of CP4.

Approach to our PR13 assessment

Regulatory techniques

4.11 Regulators use a wide variety of techniques to analyse the scope for savings in regulated companies. No single approach will necessarily provide a definitive answer on the scope for future efficiency improvement. It is preferable to look at evidence from a range of approaches and sources and exercise a degree of judgement in forming a view on what should be achievable. Economic regulators generally use both 'top-down' and 'bottom-up' approaches to assess the scope for efficiency improvement.

4.12 Bottom-up approaches focus on identifying specific improvements in efficiency, based on technologies or working methods that are known about at the time, by those undertaking the study. Therefore, by definition, a bottom-up approach, even if it is

exhaustive in its inclusion of all potential efficiency improvements that are known about at the time, is likely to understate the scope for future improvements in efficiency.

4.13 Top-down approaches typically utilise statistical techniques to produce high-level comparisons between companies or industries taking into account trends over time.

4.14 We consider that we are following best practice in efficiency assessment by using both bottom-up and top-down approaches to complement each other and provide useful evidence to inform our overall judgements.

High level approach for PR13

4.15 We have conducted our assessment of expenditure thoroughly and we have engaged with Network Rail throughout the course of PR13. Network Rail has worked with us constructively throughout the periodic review process. The independent reporters have also provided significant input to PR13.

4.16 In undertaking our assessment, we have considered the impact on safety management and also Network Rail's capability to deliver its work programme in CP5.

4.17 We have adopted a transparent approach to our work and have undertaken a significant amount of analysis to review and challenge Network Rail's submissions, including its performance plans, the asset policies, efficiency assumptions and modelling tools (including the infrastructure cost model) it has used as a basis for its plans.

4.18 At the start of PR13 we said to Network Rail that we wanted it to robustly justify its plans. It has not done this in all areas and Network Rail has recognised that there is scope for further improvements.

4.19 We asked Network Rail to set out its plans for England & Wales, Scotland and the nine England & Wales operating routes separately. Network Rail did this and we have undertaken separate assessments to produce figures for England & Wales, Scotland and for the nine England & Wales operating routes, although much of our underlying analysis has been common to the whole network.

4.20 In broad terms our approach has been to:

(a) review bottom-up calculations of how Network Rail justifies its expenditure in detail, e.g. its planned volumes of work. We have focused on:

(i) route-based assessments. In PR13 we have undertaken more of our efficient expenditure assessments at a route level based on Network Rail's route level submissions, i.e. at a much greater level of disaggregation than PR08; and

(ii) a more detailed bottom-up review of Network Rail's SBP than in PR08;

(b) benchmark Network Rail's activities against other companies in Great Britain and overseas;

(c) carry out top down assessments of Network Rail's overall efficiency for support, operations, maintenance and renewals compared to companies in the UK and in other countries. We have used comparisons against other regulated industries as we did in PR08 and made improvements to our approach compared to PR08 by benchmarking Network Rail more extensively against non-railway comparators and non-European rail comparators and by improving the econometric work we undertook in PR08; and

(d) make a judgement on the level of efficient expenditure taking into account the overall package and the achievable pace of change on efficiency.

4.21 Compared to PR08, we have relied more on our detailed benchmarking analysis and less on the top down international econometric modelling, using the latter as a 'sense check' to give us greater confidence in our analysis.

4.22 One issue that we may need to consider further is that it is not clear how much of Network Rail's efficiencies can come from alliances and other industry initiatives.

4.23 Assessing the efficient level of expenditure for enhancements is different from the approach taken for maintenance and renewal activities, although some of the same data is used. This difference is mainly due to the nature of enhancements projects, which often have bespoke solutions and include significant development and delivery costs spread over several years.

4.24 Our efficient expenditure assessment of enhancements has improved since PR08 in terms of the quality of the data available to us. We have reviewed how Network Rail captures cost data from its existing programme of works and how it uses this information in building cost estimates for the CP5 programme. This work included a review of international and non-rail benchmarks.

Cross-cutting issues

4.25 We have carried out an analysis of possible savings for each area of expenditure. But there are some potential savings – the management of inflation, input prices, frontier shift, employment costs and occupational health – that could apply to all areas of spend. We have termed these 'cross-cutting' issues and this section explains how we have treated these issues.

Network Rail's management of inflation

4.26 In our December 2012 financial issues decision document[98], we set out our approach to incentivising Network Rail to efficiently manage its inflation risk. We explained that in CP5, we will allocate input price risk to Network Rail but we will not allocate general inflation risk to Network Rail. In that document, we also said that we would commission a study to identify how efficiently Network Rail manages inflation risk and that we would further adjust our efficiency assumptions, e.g. increase or decrease them, based on the findings of the study. We considered that this will incentivise Network Rail to efficiently manage inflation in CP5.

4.27 In January 2013, we commissioned Credo to carry out the study into Network Rail's management of general inflation risk and input price inflation risk. The study included both a qualitative assessment and also a quantification of the efficiency of Network Rail's approach to managing inflation risk.

4.28 As part of its review, Credo met with Network Rail's senior management and with other Network Rail staff from its procurement functions. Credo also reviewed a variety of Network Rail's procurement contracts and developed a modelling tool to help quantify the level of efficiency in this area. Credo spoke with 18 infrastructure owners and suppliers to understand how they managed inflation risk. To assess Network Rail's overall effectiveness in managing inflation risk, Credo developed a 15 principle framework which defines what good inflation management might look like.

4.29 Credo found that Network Rail manages its expenditure to hit efficiency targets with inflation layered on top, at RPI, and that inflation is generally thought to be a factor that is beyond Network Rail's direct control. The study reported that Network Rail's paramount drive is to manage down overall costs and this means there is no explicit

[98] *Financial issues for Network Rail in CP5: decisions*, December 2012, available at http://www.rail-reg.gov.uk/pr13/PDF/pr13-financial-issues-decisions-dec12.pdf.

emphasis on managing inflation risk - it is just one of several factors that drive commercial outcomes. Credo highlighted the importance of inflation within Network Rail overall regulatory settlement. For example, it estimates that cumulative general price inflation accounts for 16% (c. £1bn) of Network Rail's total CP4 expenditure, compared to cumulative expected CP4 efficiencies of 23.5% (c. £1.4bn).

4.30 Credo found that Network Rail's 'performance gap' in relation to its management of inflation compared to the industry average was approximately 25%. Credo estimates that it may be possible to close this gap by the end of CP5, which could generate savings between £97m and £433m over CP5 (£257m in its central case scenario).

4.31 As a result of the study, we have made adjustments to our efficiency assumptions to reflect the impact on Network Rail's costs from an improvement in Network Rail's management of inflation. We recognise that it is possible that our other analysis of Network Rail's efficient expenditure may already include some of the savings from improved management of inflation. As such, at the moment we have taken a conservative view of the potential efficiencies that can be realised and applied a 0.2% per annum increase to our efficiency assumptions across Network Rail's CP5 support, operations, maintenance, renewals and enhancement costs.

Input prices

4.32 Input price inflation is the change in the prices of Network Rail's inputs (the goods and services it consumes). Input price inflation can be measured in absolute terms or relative to movements in more general price indices, such as RPI or CPI.

4.33 Our approach to risk and uncertainty in PR13 is to allocate to Network Rail the risks that it is best placed to manage. This should ensure that it is incentivised to secure continuous improvements in value for money and operate commercially where appropriate, e.g. in managing its financial risks. As we consider that it is possible to efficiently control the effect of input price inflation, Network Rail will be at risk for any deviations between the actual inflation that it faces and RPI.

4.34 In support of our approach to input prices in PR13 we have to make assumptions about the level of input price inflation that we expect Network Rail to experience in CP5.

4.35 In PR08, we adjusted our efficiency assumptions to reflect the input price inflation forecasts from a Network Rail commissioned study by LEK. Although we had some

concerns about LEK's methodology and assumptions, we considered that, overall, the results were broadly robust and represented a reasonable estimate of expected input price inflation in CP4.

4.36 However, during CP4, the observed rates of input price inflation are likely to have been significantly lower than the assumptions that we used to adjust our PR08 efficiency assumptions. Network Rail has benefited from the variations from our assumptions.

4.37 As part of its SBP, Network Rail submitted its forecast of CP5 input price inflation. In contrast to its detailed PR08 submission, the CP5 forecast was based on a high-level review of other input price forecasts, including recent regulatory forecasts. Table 4.2 sets out its forecasts. Network Rail has assumed that it will be able to absorb any input price effects within its proposed efficiency profile for support, operations and maintenance costs but not renewals.

Table 4.2: Network Rail's SBP input price inflation forecasts

Expenditure	Input price effect (per annum)
Support and operations	0.00%
Maintenance	0.00%
Renewals	-0.70%

4.38 Given the following considerations, we have decided to make no explicit adjustments to our efficiency assumptions for input price inflation:

(a) the uncertainty in forecasting and measuring input price inflation;

(b) Network Rail has assumed a low level of input price inflation over CP5 on renewals and no input price inflation over CP5 on support, operations and maintenance costs; and

(c) our approach to funding risk, i.e. in our financial framework not providing Network Rail with upfront funding for risks.

4.39 Hence our input price assumptions are zero.

4.40 However, we are still adjusting Network Rail's access charges, network grant and RAB for changes in RPI, as we do not think general inflation is efficiently controllable by Network Rail.

Frontier shift

4.41 Estimates of frontier shift for an organisation are usually inferred through the assessment of historical changes in productivity in relevant sectors (weighted appropriately to match the organisations' activities), with an adjustment, if appropriate, to reflect that some of these sectors may have seen productivity changes owing to 'catch up' as well as frontier shift.

4.42 Network Rail included a report by Oxera in its overall SBP submission, and this provided an estimate of -0.55% to -0.8% per annum for operations and support only[99]. The cumulative effect would be around 2.7% to 3.9% over CP5. This effect was considered by Network Rail together with real price effects when it derived the stretch element of its overall efficiency target.

4.43 Our assessment of the SBP is that while we understand that separating out frontier shift and other efficiencies is complex, some separation is necessary and desirable in order to produce robust results. Furthermore the approach to estimating these effects is well established. For example, the differences in methodology between Oxera's report for Network Rail and CEPA's report for ORR are small.

4.44 In comparison to PR08 and previous work, we have adopted an approach that assesses Network Rail as a whole, rather than separating out separate elements of spend because:

(a) this removes the need to take into account capital substitution[100] effects directly, for which Network Rail had raised concerns; and

(b) we are of the view that assessing frontier shift at a more aggregate level is likely to be more robust.

4.45 Our overall estimate for frontier shift, based on CEPA's analysis undertaken on our behalf (and their subsequent update) is 0.3% per annum which equates to 1.5% for

[99] Note this estimate also includes capital substitution effects.

[100] If frontier shift is assessed against separate parts of Network Rail's activities, then for those activities, the use of capital expenditure to drive efficiencies in those activities needs to be taken account of elsewhere in the business. However, if Network Rail's expenditure is assessed as a whole, the effect of the use of capital expenditure is already taken account of.

CP5 as a whole[101]. This adjustment could apply to Network Rail's total expenditure, including support, operations, maintenance, renewals and enhancements.

4.46 However, we have only made this adjustment in our estimate of enhancements efficiency (the frontier shift for enhancements expenditure only is 0.4%): we have not adjusted our efficiency assumptions for other costs. This is because it is not clear at the moment for those costs whether our efficiency assumptions include effects similar to frontier shift. We will review this issue for our final determination.

Employment costs

4.47 In January 2013, we commissioned Incomes Data Services (IDS) to review Network Rail's total employment costs and determine if they are efficient[102]. The review benchmarked the total reward package for key groups of Network Rail employees against those in other rail and non-rail industry jobs.

4.48 The IDS study found that total reward for Network Rail's role clarity grades (mainly office-based staff, e.g. accountants and information management staff) is around 9% higher than the market rate. IDS found larger gaps for maintenance and operations staff, with maintenance workers' total reward 32% above the market and operations staff 36% above the market rate. IDS's findings are consistent with our PR08 Inbucon report, given that Network Rail's pay awards for operations and maintenance staff have been above inflation in CP4. Network Rail's own analysis is broadly consistent with these findings.

4.49 Network Rail's explanation for its pay strategy for operations and maintenance staff is that it takes a wide view of overall cost savings to be achieved, taking into account factors such as productivity.

4.50 Our determination sets the overall package for Network Rail in CP5. In most cases, it does not state how Network Rail should spend the revenue that it is allowed to recover, e.g. the level of remuneration for its employees or how it should achieve its efficiency savings. The study has reinforced our view that there are significant savings that Network Rail can deliver in CP5 but we have not explicitly adjusted our efficiency

[101] This is in real terms, and is based on CEPAs 'Adjusted TFP' approach with an assumed split of 75% frontier shift and 25% catch-up for the industries upon which the calculations are based.

[102] This is available at: http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

assumptions for the findings of the IDS study because overall our efficiency assumptions are already challenging but achievable.

Occupational health

4.51 An individual's health can be influenced by the workplace. Pro-active occupational health management can be beneficial for the individual and the company and we have supported a greater focus on improving occupational health across the industry.

4.52 This section deals with the efficiencies which we have assumed that Network Rail will be able to achieve in CP5 through improvements in health risk management. In PR08, we did not make specific assumptions in this area.

4.53 In its PR13 SBP, Network Rail outlined its vision for wellbeing through promotion of a healthy lifestyle by encouraging healthy eating and improved fitness. It also acknowledged the need to support line managers in identifying and supporting colleagues with stress-related ill-health. Network Rail suggested that it self-finance its occupational health programme in CP5, i.e. spend on occupational health will be covered by corresponding productivity improvements and hence efficiency savings.

4.54 We carried out our own assessment including industry case studies of successful occupational health initiatives, and their associated cost savings. We also sought the expertise of a leading occupational health consultant in how to quantify the costs of ill-health. These costs are difficult to quantify especially since Network Rail currently holds very little data on the causes for absenteeism and its associated costs. As such, any estimate of efficiency needs to be used with caution.

4.55 In our determination we have, currently, applied a conservative increase to our overall efficiency estimates of approximately 0.07% per annum across Network Rail's support, operations, maintenance, renewals and enhancement costs to reflect the savings which could be achieved through improvements in occupational health, for example in reducing absenteeism. This amounts to approximately £20m of savings in the final year of CP5.

4.56 Network Rail must put in place an effective health programme. But its biggest challenge is to induce a culture change within the organisation to encourage engagement in its occupational health programme. This efficiency assumption will provide an appropriate incentive.

Efficient expenditure assumptions

4.57 This section outlines our specific assumptions in each area of spend, including the cross-cutting savings explained above.

Support costs

4.58 Support costs include expenditure on activities that 'support' Network Rail's business. These are mainly administrative costs, such as costs related to finance, but include other running costs such as utilities costs and insurance.

4.59 In its SBP, Network Rail set out its plan to deliver a 24% reduction in its support costs over CP5. This includes cost reductions by the end of CP5 (compared to 2013-14 costs) of 12% in core support costs.

4.60 Our approach to the assessment of Network Rail's support costs is set out in detail in the support expenditure chapter (chapter 5). In summary, we have decided on a base year and 'rolled forward' costs for that year through each year of CP5 by applying an efficiency assumption. We have derived our efficiency assumption by applying a combination of both top-down and bottom-up approaches. Where Network Rail has provided robust analysis of its functions' costs, we have taken Network Rail's forecast. However, where Network Rail has provided insufficient justification for its forecasts, we have applied a top-down efficiency estimate to our view of Network Rail's pre-efficient costs.

4.61 Our assessment of efficient support costs for CP5 assumes that Network Rail can achieve efficiencies in core support costs of 20% by the final year of CP5 and a reduction in total support costs of 25% by the end of CP5. Overall there is a saving of £647m in CP5 compared to total CP4 support costs of £2,740m.

Operations costs

4.62 Operations costs are those incurred in 'operating' the infrastructure such as costs for signallers and control staff.

4.63 In its SBP, Network Rail set out its plan to deliver a 13% reduction in its operations costs over CP5. Its main proposal for delivering the planned efficiencies is to implement a new way to run its infrastructure, known as the network operating strategy. This will cut Network Rail costs as it will reduce the number of signallers required.

4.64 We have reviewed Network Rail's proposals against various domestic and European benchmarks. We have also conducted our own assessment as to whether the strategy can deliver the proposed benefits. Network Rail will compare favourably with international benchmarks once the strategy is implemented. However, costs for operations activities outside signalling are above benchmarks with other UK regulated industries. For our assessment of these non-signaller costs, we have taken into account domestic benchmarks and savings from cross cutting issues.

4.65 Our assessment of Network Rail's efficient operations costs in CP5 assumes that Network Rail can achieve 17% efficiencies by the final year of CP5. This is a saving of £271m in CP5 compared to total CP4 operations costs of £2,239m.

Maintenance and renewals

4.66 Maintenance expenditure covers the work required to maintain assets efficiently and sustainably. Maintenance work may be either planned (for example, routine or visual inspections) or reactive (for example, responding to asset failures). Maintenance expenditure is forecast and assessed for each of the following main asset categories: track, civil structures and earthworks, signalling, electrification, telecommunications, and plant and machinery.

4.67 Renewals expenditure covers work to replace assets which have reached, or are nearing, the end of their useful lives with the modern equivalent asset. Renewals expenditure is forecast and assessed for the same asset types as maintenance (track, civil structures and earthworks, signalling, electrification, telecommunications, plant and machinery) as well as buildings, and other renewals.

4.68 In Network Rail's SBP, its maintenance plans for CP5 assumed efficiencies of 13.7% by the final year of the control period and total maintenance expenditure in CP5 of £5,243m. (These figures are our interpretation once accounting changes between the periods and the effects of traffic and network growth have been adjusted for).

4.69 Network Rail's renewals plans for CP5 assumed an increase in expenditure requirements compared to CP4, driven by a programme of rationalisation and centralisation of signalling and electrical control, a large increase in expenditure on civil structures and earthworks, accelerated renewals (due to enhancements), a programme to improve asset information and additional investment schemes. It planned efficiency savings of 15.7% by the final year of the control period and total

renewal expenditure in CP5 of £13,791m. (These figures are our interpretation, adjusting for accounting changes between the periods. The efficiencies include those embedded in Network Rail's proposed CP5 asset policies and consider efficiency across all costs classified as renewals, whereas Network Rail's efficiency assumption is based on a subset of renewals asset types.)

4.70 Our approach to the assessment of maintenance and renewal efficiencies is set out in detail in chapter 8. In summary, we have carried out both a bottom-up and top-down assessment of efficiency, including:

(a) a detailed review of Network Rail's plans, including the audit of its benchmarking work and SBP efficiencies;

(b) our bottom-up benchmarking and efficiency studies conducted for PR13;

(c) our review of previous studies (for example those carried out for PR08 and for the RVfM study) and cataloguing of remaining efficiency opportunities; and

(d) our top-down statistical (econometric) analysis of the efficiency gap to the frontier rail infrastructure manager.

4.71 The efficiency assumed in our assessed maintenance and renewal efficient expenditure draws mainly, on (a) to (c) with (d) used as a sense check.

4.72 We assume that Network Rail can achieve maintenance efficiencies of 16.5% by the final year of the control period. We assess that it needs to spend £5,152m on maintenance during CP5, £91m less than proposed in the SBP.

4.73 Our assessment of efficient renewals expenditure for CP5 assumes lower levels of pre-efficient expenditure where its plans were not sufficiently justified or where we are proposing a different approach. For example, we have reduced pre-efficient plans for issues identified in unit cost calculations and made reductions to buildings, information management and R&D expenditure. We assess that Network Rail can achieve renewals efficiencies of 20.1% by the final year of the control period. We assess that Network Rail needs to spend £12,173m on renewals during CP5. This is £1,618m less than proposed in the SBP.

Enhancements

4.74 As we discussed above, our assessment of the efficient level of expenditure for enhancements is different from the approach taken for other costs. Firstly we looked

at whether the proposed projects were required to meet the HLOSs. We then scrutinised individual project costs and portfolio efficiency overlays.

4.75 Of the £12.4bn costs in Network Rail's SBP, there were about £3.2bn of costs for projects determined outside of the review (Thameslink, Crossrail, Borders and an element of EGIP[103]) and £1.3bn of costs for ring-fenced funds. We scrutinised the remaining £7.9bn which we reduced to £7.2bn, largely as a result of applying Network Rail's own efficiency overlay to more projects where it was reasonable to do so and reducing risk allowances where we concluded that the levels in cost estimates were too high.

4.76 Finally we added about £0.6bn into the settlement for: an assumed level of non-government funded schemes (to be consistent with our assessment of other single till income); extra Schedule 4 costs as a result of the recalibration of Schedule 8; and funding for research and development.

Package

4.77 In our 2003 determination, we assumed that Network Rail could achieve efficiency improvements of 31% by the end of CP3 (i.e. 2008-09) on its support, operations, maintenance and renewals costs. In our 2008-09 annual efficiency and finance assessment of Network Rail[104], we found that the company has achieved efficiencies of 27% in CP3.

4.78 In PR08, we assessed that the efficiency gap for Network Rail's support, operations, maintenance and renewals expenditure at the end of CP3 was 35%. In PR08, we set Network Rail's revenue requirement on the assumption that it could close around two thirds of this gap in CP4, i.e. achieve 21% efficiencies by the end of CP4. Given that Network Rail is now forecasting that it will achieve efficiencies of 18% in CP4, that means that the gap at the end of CP4, based on our PR08 analysis, would be 17%.

4.79 After fully considering our duties and Network Rail's capability to safely and sustainably deliver efficiency savings, we have decided that it is reasonable to assume that Network Rail will achieve the savings we have identified in five years, i.e. within CP5.

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[103] The Edinburgh to Glasgow Improvement Programme.

[104] The annual efficiency and finance assessment of Network Rail 2008-09 is available at: http://www.rail-reg.gov.uk/upload/pdf/404.pdf.

Overview of efficiency assumptions

4.80 Our determination of Network Rail's efficient expenditure reflects our assessment of both the expenditure-specific analysis and the cross-cutting issues discussed above.

4.81 Tables 4.3, 4.4 and 4.5 set out the efficiency assumptions that we have applied to Network Rail's support, operations, maintenance and renewals expenditure.

Table 4.3: Our assumptions on CP5 efficiency (Great Britain)

Expenditure	2014-15	2015-16	2016-17	2017-18	2018-19	CP5 total
Support	9.1%	4.9%	6.3%	3.4%	4.4%	25.2%
Operations	1.9%	2.9%	4.3%	4.2%	5.4%	17.4%
Maintenance	4.0%	3.4%	3.5%	3.4%	3.4%	16.5%
Renewals	8.2%	3.7%	4.2%	3.0%	2.8%	20.1%
Weighted average efficiency	**6.8%**	**3.7%**	**4.2%**	**3.2%**	**3.3%**	**19.6%**

Table 4.4: Our assumptions on CP5 efficiency (England & Wales)

Expenditure	2014-15	2015-16	2016-17	2017-18	2018-19	CP5 total
Support	9.1%	4.9%	6.3%	3.4%	4.3%	25.1%
Operations	2.0%	2.8%	4.3%	3.9%	5.5%	17.3%
Maintenance	4.0%	3.4%	3.5%	3.4%	3.5%	16.7%
Renewals	8.2%	3.7%	4.1%	3.0%	2.8%	20.1%
Weighted average efficiency	**6.7%**	**3.7%**	**4.2%**	**3.2%**	**3.3%**	**19.5%**

Table 4.5: Our assumptions on CP5 efficiency (Scotland)

Expenditure	2014-15	2015-16	2016-17	2017-18	2018-19	CP5 total
Support	9.6%	5.1%	6.2%	3.5%	4.6%	25.9%
Operations	1.3%	3.8%	3.8%	6.7%	4.1%	18.3%
Maintenance	3.8%	3.2%	3.3%	3.1%	3.1%	15.5%
Renewals	8.3%	3.4%	4.9%	2.9%	3.0%	20.7%
Weighted average efficiency	**6.8%**	**3.7%**	**4.5%**	**3.3%**	**3.3%**	**19.9%**

5. Support expenditure

Key messages in this chapter

- Support costs are mainly administrative costs that Network Rail incurs to deliver its outputs, such as costs related to finance, human resources and information management. However, this category also includes other running costs such as utilities costs and insurance.
- We have reviewed Network Rail's proposals and assessed them against a number of rail and non-rail benchmarks. We have seen some improvements in Network Rail's analysis compared to PR08.
- Network Rail's support functions have made progress in reducing costs during CP4. However, there are still inefficiencies to be addressed in CP5.
- We have determined Network Rail's total support costs to be £2,093m over CP5. This is £139m less than Network Rail forecast in its SBP and £647m less than Network Rail's CP4 costs (based on its PR13 SBP forecast).
- This represents a 20% efficiency improvement in Network Rail's core support costs (i.e. excluding group costs and other support functions). Network Rail assumed a 12% efficiency improvement.
- Our forecast of Network Rail's expenditure on support costs in our determination is 5.5% of Network Rail's total expenditure.
- Our assumptions in our advice to ministers for Network Rail's expenditure on support costs were a low of £1,833m and a high of £2,173m.

Structure of this chapter

5.1 This chapter is structured as follows:

(a) introduction to the chapter;

(b) description of support costs;

(c) Network Rail's proposal;

(d) our assessment; and

(e) our decisions.

Introduction

5.2 This chapter summarises our assessment of Network Rail's CP5 expenditure on its support functions.

Description of support costs

5.3 Network Rail's operating expenditure includes support costs, operations expenditure and industry costs and rates. In this chapter, we explain our assessment of Network Rail's support costs only. We cover operations costs and industry costs and rates in the next two chapters.

5.4 Support costs include expenditure on activities that 'support' Network Rail's business. These are mainly administrative costs, such as costs related to finance, human resources (HR) and information management. This category also includes other running costs such as utilities costs and insurance.

5.5 Some of Network Rail's support costs are 'recharged' to other parts of the business, i.e. they are included in operations, maintenance, renewals and enhancements expenditure. For its regulatory accounts and its SBP, these recharges are calculated in accordance with the rules set out in our regulatory accounting guidelines (RAGs)[105]. The figures we present in this chapter are shown after any recharges[106].

5.6 Since PR08, Network Rail has made a number of changes to its definition of support costs. For example, pensions and staff incentives costs are now charged to the rest of the business, e.g. operations instead of being held in support costs.

5.7 Support costs are an important part of Network Rail's overall revenue requirement, especially as they funded in the year they are incurred. Network Rail spent £477m (in 2012-13 prices) on support costs in 2011-12 (after recharges) and Network Rail's SBP assumed that support costs will be around 6% of its total support, operating, maintenance, renewals and enhancement expenditure in CP5, and around 8% of its projected gross revenue requirement.

[105] The RAGs are available at: http://www.rail-reg.gov.uk/server/show/nav.149.

[106] Network Rail presents its support costs data after recharges. We have used the same approach in presenting our analysis in our determination but we have analysed total support costs before recharges to other parts of Network Rail's business.

Network Rail's proposal

5.8 As part of PR13, Network Rail has generally produced more comprehensive analysis and supporting information than it did in PR08. For example, in support of its SBP, Network Rail has independently benchmarked (for example against external comparators) 95% of support costs across its corporate services (HR, finance, information management etc.) and has provided detailed function-by-function plans. This has given us a better view of Network Rail's costs and ultimately allows us to make more informed decisions.

5.9 However, Network Rail has not provided a satisfactory analysis of the reconciliation of its other operating income or its capitalisation of overheads (i.e. recharges to other areas of the business). We will do more work on other operating income in the summer and we discuss our approach to the capitalisation of overheads issue below.

5.10 In its SBP, Network Rail set out its plan to deliver a 24% reduction in its support costs over CP5[107]. This includes cost reductions by the final year of CP5 (compared to 2013-14 costs) of 12% in core support costs (including its accommodation costs).

5.11 Network Rail's cost savings are driven by a number of initiatives, including the development of a new operating model for its central functions, e.g. HR, which will allow it to more effectively support the frontline.

5.12 Table 5.1 sets out Network Rail's SBP assumptions of efficiency and total CP5 costs for its support functions.

Table 5.1: Network Rail's SBP forecast of support costs in CP5

£m (2012-13 prices)	Great Britain CP5 efficiency	Great Britain	England & Wales	Scotland
Human Resources	22.5%	273	245	27
Information Management	-10.4%	324	292	32
Government and Corporate Affairs	16.1%	86	77	9
Group Strategy	21.5%	53	48	5

[107] Network Rail's total savings in its SBP were presented as a comparison between the last year of CP5 and the last year of CP4 and did not adjust for atypical costs in the last year of CP4.

£m (2012-13 prices)	Great Britain CP5 efficiency	Great Britain	England & Wales	Scotland
Finance	16.3%	129	116	13
Business Services	20.8%	66	59	7
Accommodation	16.0%	339	319	20
Utilities	6.7%	186	168	19
Insurance	3.9%	259	233	26
Legal and Inquiry	5.1%	30	27	3
Safety and Sustainable Development	48.0%	39	35	4
Strategic Sourcing	27.5%	44	39	4
Business Change	23.7%	16	14	2
Other corporate functions	9.4%	16	14	2
Core support costs (excluding group)	12.3%	1,860	1,688	172
Asset Management Services	20.1%	205	184	20
Network Rail Telecom	41.3%	172	154	17
National Delivery Service	134.9%	7	7	1
Investment Projects	0.0%	0	0	0
Commercial property	168.4%	(19)	(18)	(1)
Support costs (excluding group)	**19.4%**	**2,224**	**2,015**	**209**
Group costs	88.0%	8	7	1
Support costs (including group)	**24.2%**	**2,232**	**2,022**	**210**

5.13 Network Rail's support costs include 'group costs'. These costs are usually large/one-off items or recharges to elsewhere in the company. We provide a breakdown of Network Rail's SBP forecast of CP5 group costs, consistent with the analysis above, in Table 5.2.

Table 5.2: Network Rail's SBP forecast of group costs in CP5

Group cost (£m 2012-13 prices)	CP5 total
Income from High Speed 1	(28)
Consultancy / legal / other	25
Project support recharges	(122)
Redundancy costs	100
Contingency	33
Total group costs	**8**

Our assessment

Overview

5.14 We have made an assessment of the efficient level of Network Rail's support costs in CP5. We have reviewed Network Rail's SBP and supporting evidence, commissioned external consultancy studies on certain areas of support costs as discussed below, and carried out our own analysis to support our assessment.

5.15 Our approach to assessing Network Rail's support costs was to

(a) select a base year (2013-14);

(b) adjust the base year to remove any atypical or inappropriate costs;

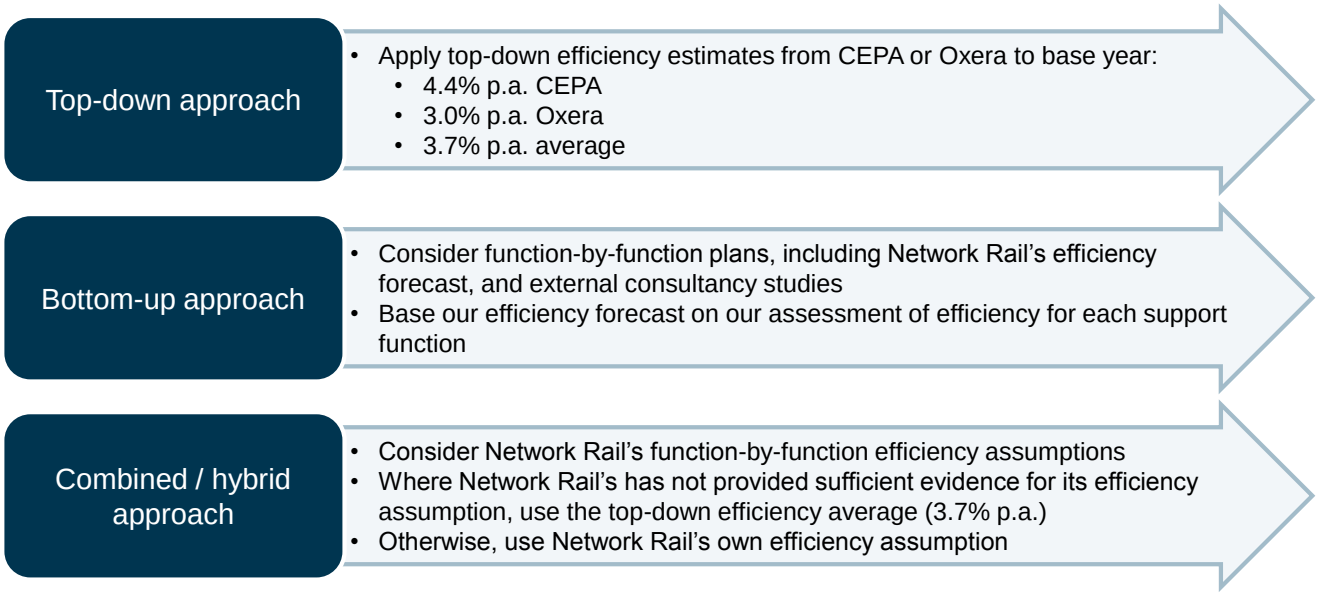
(c) roll forward the base year for each year of CP5 to give the pre-efficient costs;

(d) apply our own efficiency assumption to the pre-efficient costs; and

(e) decide between a bottom up efficiency assumption and a top down efficiency assumption.

5.16 Figure 5.1 sets out the three main options for determining Network Rail's efficient support costs in CP5.

Figure 5.1: Options for determining Network Rail's efficient support costs



5.17 We have based our assessment of Network Rail's CP5 support costs on the combined/hybrid approach. This means that where Network Rail has provided robust analysis of its functions' costs, we have used Network Rail's forecast of costs. However, where Network Rail has provided insufficient justification for its forecasts, we have applied a top-down efficiency assumption to our view of Network Rail's pre-efficient costs.

5.18 Our top-down efficiency assumption has been calculated by taking the average of CEPA's forecast of 4.4%[108] and Oxera's forecast of 3.1%[109]. We recognise that the use of a top-down efficiency assumption is subjective, so by taking this approach we have made our determination more robust.

Base year

5.19 In our assessment of Network Rail's support costs, we used Network Rail's latest forecast of 2013-14 expenditure as the basis of our analysis. However, in any one year, Network Rail may incur one-off costs or receive one-off income, e.g. fines. So that we could assess a representative year of expenditure, i.e. it is comparable to future years' spend, we have removed any significant one-off or 'atypical' costs (or

[108] We commissioned CEPA to produce a study on the scope for Network Rail to achieve efficiency gains in operations and support costs in CP5. This is available at: http://www.rail-reg.gov.uk/pr13/PDF/cepa-orr-om-productivity-over-cp5.pdf.

[109] Network Rail included in its SBP, a study by Oxera on the scope for efficiency improvements in Network Rail.

income) from the base year. We set out the adjustments that we have made later in this chapter.

Capitalisation (and recharges)

5.20 Network Rail's support functions provide services to other areas of the business where the costs of these activities are capitalised rather than expensed in the year, e.g. renewals expenditure.

5.21 As part of its SBP, Network Rail provided a high level reconciliation of transfers of support costs into renewals and enhancement costs, which we have reviewed. This analysis showed an additional capitalised cost of £62m in CP5, which was not consistent with its assumptions on support costs. Network Rail has not been able to adequately explain this inconsistency and the burden of proof is on it to show that its unit costs are appropriate and as we explain in the asset management: maintenance and renewals chapter (chapter 8), it has not done this. As a result, for our determination, we have deducted £62m from enhancement costs[110]. We have assumed that all capitalised costs are variable and so we have changed the costs that are included in capital expenditure in line with any reduction or increase in our underlying capital expenditure assumptions.

Our consultancy studies

Overview

5.22 Compared to PR08, we have completed a more wide ranging set of studies on support costs. These studies are summarised below and each study, or an executive summary of the study, is available on our website[111].

Top-down comparison of Network Rail's support & operations costs against other companies (CEPA)

5.23 The purpose of this study was to provide estimates of Network Rail's scope for achieving efficiency gains in operations and support costs over CP5. This study drew on the historical performance of other UK network industries and different sectors' productivity performance in order to determine the possible scope for efficiency gains. CEPA used the following methods to provide a range for the scope for efficiency

[110] This was a more straightforward way of making the adjustment than adjusting both renewals and enhancements expenditure.

[111] These studies are available at: http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

gains: Real Unit Operating Expenditure (RUOE); Total Factor Productivity (TFP); and Labour, Energy, Materials and Services cost measure (LEMS).

5.24 CEPA found that, subject to Network Rail delivering its CP4 targets, the average annual change in RUOE, of 4.4% (for comparator industries in their third price control[112]), and the LEMS cost measure for electricity, gas and water supply (11-15 years since privatisation), of 5.1%, respectively, could represent an appropriate annual target for each year of CP5. Savings of this order are consistent with broader studies of Network Rail's relative efficiency, e.g. the benchmarking work included in the RVfM study, which suggests that Network Rail's costs are significantly higher in a range of activities than those of its international peers[113].

International support and operations benchmarking (Civity)

5.25 We commissioned consultants, Civity, to benchmark Network Rail's support and operations expenditure against other railway infrastructure managers. The aim was to help us understand whether, and to what extent, there is a gap between the efficiency of Network Rail's support and operations expenditure and that of comparators (particularly the most efficient rail infrastructure managers). Civity's views on operations costs are included in the operations expenditure chapter (chapter 7).

5.26 For support costs, Civity found that, in relation to its peers (based on total expenditure, staff size, and labour costs), Network Rail's total expenditure on support functions (representing 8% of its total annual expenditure) is in the middle of the peer group. Civity also found that this was the case for individual support functions, with the exception of procurement, where Network Rail's position is at the higher end of the peer group. However, Civity did conclude that the current positioning of Network Rail relative to its peers cannot be used to draw reliable conclusions on Network Rail's efficiency and that further disaggregation of costs would be necessary to produce more reliable analysis. We think that this study has identified a number of useful

[112] CEPA based its assumptions on the third control period because it assumes that when Network Rail took over its responsibilities, the effect of Railtrack's problems had reset efficiency levels to the level at privatisation. Therefore, as CP5 is the third control period after Network Rail took over its responsibilities, CEPA's analysis was based on the efficiency levels in comparator industries in their third control period.

[113] These savings are similar to the analysis that Oxera carried out for us in PR08. Oxera's PR08 study is available at: http://www.rail-reg.gov.uk/upload/pdf/pr08-oxeraeffic-160408.pdf.

issues but we have not used it to inform our determination of support costs for CP5 due to the issues over data reliability highlighted by Civity.

Pace of change study (BDO/CEPA)

5.27 The purpose of the study was to develop a greater understanding of the potential pace of change of cost savings that Network Rail could achieve in its support functions over CP5. The study considered a number of companies and reviewed how they reacted to significant changes to their businesses, e.g. from mergers, regulatory change through a price control and changing markets. The study also sought to estimate Network Rail's fixed and variable support costs and determine how the split between fixed and variable costs can impact on a company's ability to react to a significant business change, e.g. a merger, acquisition or price control.

5.28 The study found that major change within other organisations can often be seen first in support costs, with significant cost reductions achievable within two to four years, although this was potentially more difficult to sustain in the long term. The study also found that where there is a significant business imperative, e.g. potential bankruptcy, the pace of change is at its most rapid and most extensive. When reflecting on Network Rail's current position, the report concluded that Network Rail's historic pace of change in support costs has been slow and steady and that there was scope to increase the speed at which Network Rail implements its change programmes.

Insurance costs (Willis)

5.29 We commissioned Willis (an insurance broker) to review Network Rail's proposed annual insurance costs for each year of CP5 to consider whether Network Rail's overall insurance strategy is appropriate and whether its proposed insurance costs are efficient, e.g. are there some risks that Network Rail could manage more efficiently than it is proposing?

5.30 Willis concluded that Network Rail's overall approach to insurance costs is efficient. However, it identified some aspects of its insurance cover where Network Rail may not take an efficient approach.

Network Rail studies

5.31 In support of the IIP, SBP and as part of progressive assurance, Network Rail has commissioned a number of external and internal studies. We have considered this analysis in our assessment of Network Rail's CP5 support costs.

5.32 These studies included:

(a) Hackett benchmarking of key support functions, e.g. HR;

(b) IPD workplace management benchmarking;

(c) Gartner study on information management; and

(d) Arup review of NDS.

Our decisions

Overview

5.33 In support of our assessment of Network Rail's support costs in CP5, we have considered:

(a) whether we need to make adjustments to base year costs;

(b) any implications of Network Rail's approach to capitalisation and recharging of support costs;

(c) the findings of the studies that we have commissioned to review different elements of Network Rail's support costs;

(d) the studies provided by Network Rail (both internal and external) in support of its IIP, progressive assurance and SBP;

(e) whether Network Rail has included any contingency within its forecasts and we have excluded contingency where relevant; and

(f) the additional overlay for Network Rail's management of inflation and occupational health.

Base year

5.34 We have reviewed Network Rail's SBP forecast of its expenditure of £554m on support costs in 2013-14. We have identified a number of one-off (or atypical) costs or costs that it is not appropriate to include in our assessment of CP5 support costs, e.g. fines, contingency, CP4 specific expenditure and a double-count with our other assumptions on Network Rail's expenditure in CP5 and have adjusted the base year for them.

5.35 These adjustments, resulting in a reduction in costs of £45m, include:

(a) a reduction in one-off incomes/costs in 2013-14 (£15m);

(b) a reduction in contingency (£26m) as we are not providing specific contingency for support costs in CP5 and Network Rail can use its balance sheet buffer to manage the risks involved with this expenditure;

(c) a reduction in CP4 funds (£11m), this is expenditure on the performance fund and the seven day railway fund in 2013-14), which is not needed in CP5;

(d) a reduction in insurance costs to reflect a double count of Schedule 4 & 8 costs (£3m);

(e) an increase in information management costs to reflect increase in support costs for the Traffic Management System (£5m) (Network Rail assumed £6m in its SBP); and

(f) an increase in utilities costs (£5m), to correct an error in Network Rail's forecast.

5.36 These adjustments result in an adjusted base year expenditure of £509m (as shown in Table 5.3), compared to Network Rail's SBP assumption of £554m.

Pace of change

5.37 We think that our assessment of Network Rail's support costs is challenging but achievable, when considered as part of the overall PR13 package. We can see from the BDO/CEPA study on the pace of change that there are examples of companies that have delivered significant cost savings within 18 to 24 months. However, given the overall challenge present in the overall PR13 package, we think that the speed of cost savings in this area is reasonable.

Efficient forecast of costs

5.38 On the basis of our assessment, we have assumed Network Rail's total support costs will be £2,093m over CP5. This is £139m less than Network Rail forecast in its SBP and £647m less than Network Rail's CP4 costs (based on its PR13 SBP forecast). This represents a 20% efficiency in Network Rail's core support costs (i.e. excluding group costs and other support functions).

5.39 Our forecast of Network Rail's expenditure on support costs in our determination is £2,093m, this is 5.5% of Network Rail's total expenditure and our advice to ministers assumptions for Network Rail's expenditure on support costs were a low of £1,833m and a high of £2,173m.

5.40 Tables 5.3, 5.4, 5.5, and 5.6 set out our efficiency assumptions for CP5 and the implied post-efficient level of support costs[114].

[114] The CP4 total is taken from Network Rail's SBP and is not adjusted for atypical costs.

Table 5.3: ORR assessment of CP5 support costs (Great Britain)

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14[115]	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Human Resources	63	59	59	53	51	48	271
Information Management	64	61	59	57	54	52	283
Government and Corporate Affairs	20	18	18	17	17	16	85
Group Strategy	13	11	11	11	10	10	53
Finance	29	28	27	25	24	24	128
Business Services	16	14	13	13	13	12	65
Accommodation	77	72	72	65	65	63	337
Utilities	44	41	41	40	39	38	201
Insurance	50	48	46	44	43	41	222
Legal and Inquiry	6	6	6	5	5	5	27
Safety and Sustainable Development	13	10	8	7	7	7	39
Strategic Sourcing	11	10	9	9	8	8	43
Business Change	4	4	3	3	3	3	16
Other corporate functions	4	3	3	3	3	3	16
Core support costs (excluding group)	**412**	**385**	**375**	**353**	**343**	**331**	**1,786**
Efficiency	N/A	6.7%	2.6%	5.7%	3.0%	3.5%	19.8%
Asset Management Services	51	41	41	40	41	40	203
Network Rail Telecom	45	45	36	31	29	25	166
National Delivery Service	7	5	3	1	0	(2)	7
Investment Projects	0	0	0	0	0	0	0
Commercial property[116]	7	(3)	(3)	(4)	(5)	(5)	(20)
Support costs (excluding group)	**522**	**474**	**452**	**422**	**407**	**388**	**2,143**
Group costs	(13)	(11)	(12)	(10)	(9)	(7)	(50)
Support costs (including group)	**509**	**463**	**440**	**412**	**398**	**381**	**2,093**
Efficiency	N/A	9.1%	4.9%	6.3%	3.4%	4.4%	25.2%

[115] 2013-14 is an adjusted base year as described above, Network Rail's forecast for 2013-14 is £554m.

[116] Network Rail's SBP separates out its commercial property costs from its support costs. However, for our analysis we include commercial property costs within our support cost analysis.

Table 5.4: High level ORR assessment of CP5 support costs (Great Britain)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4*	CP5
Efficiency assumption	N/A	9.1%	4.9%	6.3%	3.4%	4.4%	N/A	**25.2%**
Post-efficient costs	509	463	440	412	398	381	2,740	**2,093**

* The CP4 total is taken from Network Rail's SBP and is not adjusted for atypical costs.

Table 5.5: High level ORR assessment of CP5 support costs (England & Wales)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4*	CP5
Efficiency assumption	N/A	9.1%	4.9%	6.3%	3.4%	4.3%	N/A	**25.1%**
Post-efficient costs	458	416	396	371	358	343	2,466	**1,884**

* The CP4 total is taken from Network Rail's SBP and is not adjusted for atypical costs.

Table 5.6: High level ORR assessment of CP5 support costs (Scotland)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4*	CP5
Efficiency assumption	N/A	9.6%	5.1%	6.2%	3.5%	4.6%	N/A	**25.9%**
Post-efficient costs	51	46	44	41	40	38	274	**209**

* The CP4 total is taken from Network Rail's SBP and is not adjusted for atypical costs.

6. Traction electricity, industry costs and rates

Key messages in this chapter

- We have updated Network Rail's forecast of traction electricity costs for the latest forecast of electricity prices in CP5. This has reduced the forecast of traction electricity costs in Great Britain by £524m in CP5 compared to Network Rail's SBP.
- We have reviewed Network Rail's proposals and we have concluded that efficiencies can be made in British Transport Police (BTP) costs. This has reduced the forecast of Network Rail's share of BTP costs in Great Britain by £26m in CP5 compared to Network Rail's SBP. Network Rail did not assume any efficiencies for these costs.
- Our forecast total expenditure on traction electricity, industry costs and rates in CP5 in our determination is £3,114m, which is 8.2% of Network Rail's total expenditure.
- Our assumptions in our advice to ministers were a low of £2,997m and a high of £3,378m.

Introduction

6.1 This chapter summarises Network Rail's proposals and our assessment of Network Rail's CP5 expenditure on traction electricity, industry costs and rates.

Definition of traction electricity, industry costs and rates

6.2 Network Rail's influence over the costs covered in this chapter varies as described in the financial framework chapter (chapter 12). Therefore, as was the case in PR08, each of these costs needs a bespoke treatment as discussed below. The costs include:

(a) traction electricity;

(b) business rates (i.e. cumulo rates);

(c) British Transport Police (BTP) costs;

(d) the Railway Safety and Standards Board (RSSB) levy;

(e) ORR licence fee and the railway safety levy; and

(f) other. This includes reporters' fees and Confidential Incident Reporting & Analysis System (CIRAS) fees.

Network Rail's proposals

6.3 Network Rail does not consider these costs to be fully controllable, with the exception of its own traction electricity costs. As such Network Rail's SBP did not include any efficiency assumptions for these costs. We have set out Network Rail's CP5 assumptions for Great Britain, England & Wales and Scotland in tables 6.1, 6.2 and 6.3.

Table 6.1: Network Rail's SBP CP5 traction electricity, industry costs and rates (Great Britain)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5[117]
Traction electricity	238	247	480	495	532	589	1,226	2,343
Business rates	151	149	149	150	168	172	577	787
British Transport Police	71	71	71	71	71	71	385	355
RSSB	9	9	9	8	8	8	46	41
ORR licence fee and railway safety levy	17	16	15	15	14	14	115	74
Other industry costs	5	5	5	5	5	5		24
Total	**491**	**496**	**729**	**743**	**798**	**858**	**2,349**	**3,624**

[117] In the executive summary of this document, we show total CP5 traction electricity, industry costs and rates of £3,701m. The additional £77m compared to Table 6.1 reflects costs that Network Rail included in its SBP for the maintenance of assets transferred from British Rail Residuary Board (£10m) and to reflect its estimate of the costs it could potentially incur from the asymmetry of the route-level efficiency benefit sharing (REBS) mechanism (£67m), i.e. although it may meet our efficiency assumptions in aggregate, underperformance in some routes and outperformance on others could lead to a net payment from Network Rail to train operators. We have included no funding for these issues in our determination as we think our package is deliverable by Network Rail and it would be inappropriate for us to assume ex-ante that Network Rail will underspend in some areas of the package and overspend in other areas. Also, our understanding was that the effect of the transfer of British Rail Residuary Board assets should be neutral for Network Rail.

Table 6.2: Network Rail's SBP CP5 traction electricity, industry costs and rates (England & Wales)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5
Traction electricity	224	232	447	461	498	553	1,158	2,192
Business rates	135	133	134	134	151	154	515	705
British Transport Police	66	64	64	64	64	64	348	320
RSSB	8	8	8	7	7	7	41	37
ORR licence fee and railway safety levy	19	14	13	13	12	12	100	64
Other industry costs		5	5	4	4	4		22
Total	**452**	**455**	**670**	**684**	**736**	**794**	**2,162**	**3,339**

Table 6.3: Network Rail's SBP CP5 traction electricity, industry costs and rates (Scotland)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5
Traction electricity	14	15	33	33	34	36	68	151
Business rates	16	16	16	16	18	18	62	82
British Transport Police	7	7	7	7	7	7	37	35
RSSB	1	1	1	1	1	1	5	4
ORR licence fee and railway safety levy	2	2	1	1	1	1	15	7
Other industry costs		1	0	0	0	0		2
Total	**40**	**40**	**58**	**59**	**62**	**63**	**187**	**282**

Our assessment

6.4 We have reviewed Network Rail's SBP submissions for industry costs and rates and considered the justification that it has provided us for its forecasts. As we set out in chapter 12, our approach to these costs is as follows:

(a) Network Rail's own use of traction electricity is controllable by Network Rail, so we have incentivised it to manage these costs efficiently;

(b) we think Network Rail can sufficiently influence the transmission losses element of traction electricity costs and the costs of BTP, RSSB and reporters, so we have incentivised Network Rail to aid the efficient management of BTP and RSSB costs and manage reporters costs efficiently;

(c) for business rates, as long as Network Rail can satisfy us that it has negotiated them efficiently, we will log-up/down any variations from the level we assumed in our determination and adjust Network Rail's allowed revenues in CP6; and

(d) we do not think that the costs of the ORR licence fee and railway safety levy and the other industry costs, e.g. CIRAS fees are sufficiently controllable by Network Rail, so we will log-up/down any variances in these costs between the assumptions in our determination and the outturns and the variances will be included in the opex memorandum account.

Overview of our analysis

Traction electricity

6.5 Network Rail recovers the vast majority of its traction electricity costs from train operators who require electricity to run their electrified train services. Network Rail also supplies traction electricity to third parties such as London Underground.

6.6 Network Rail does use a relatively small amount of traction electricity for supporting the operation of the railway, e.g. for signalling and at major stations such as London Euston. This costs approximately £10m per year.

6.7 Our review of traction electricity has taken place alongside our work on traction electricity charges. In the access charges chapter (chapter 16) we set out how we have calculated our forecast of traction electricity costs and how Network Rail is incentivised to manage efficiently transmission losses and its own use of traction electricity.

6.8 We are content with the general approach taken by Network Rail in calculating its forecast of traction electricity costs for CP5. However, its forecasts are underpinned by the Department of Energy and Climate Change (DECC) projections from 2011. More recent DECC data from October 2012 is now available and we have updated Network Rail's forecasts using that data as they are the most up to date projections available.

6.9 Using the latest DECC data has the effect of reducing the forecast of total traction costs in CP5 compared to Network Rail's forecast in its SBP of £524m. However, there is still a large amount of uncertainty over future electricity prices, so we will review our assumptions for the final determination. Table 6.4 sets out our determination of traction electricity costs for CP5.

Table 6.4: Our determination of traction electricity costs for CP5

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5
Great Britain	238	247	345	378	399	452	1,226	1,819
England & Wales	224	232	321	352	373	424	1,158	1,702
Scotland	14	15	24	26	26	27	68	117

6.10 Overall our assumptions for traction electricity costs of £1,819m for Great Britain, £1,702m for England & Wales and £117m for Scotland are respectively lower than Network Rail's SBP forecast by £524m for Great Britain, £490m for England & Wales and £34m for Scotland[118].

Business rates (i.e. cumulo rates)

6.11 Network Rail's business rates are fixed in real terms for the first three years of the control period, as a result of the previous rating revaluation in 2010. The next rating revaluations for England, Wales and Scotland have been deferred by the governments and now will take effect in April 2017. Network Rail has provided an estimate of the potential revaluation and its effect on the business rates that it pays from 2017.

6.12 We have discussed these estimates with Network Rail and we think that they are probably too conservative. The estimates are by definition subjective and uncertain,

[118] Network Rail's forecasts in its SBP were £2,343m for Great Britain, £2,192m for England & Wales and £151m for Scotland.

so we will review our assumptions for our final determination. This will also allow us to discuss the estimates of business rates with Network Rail after it has had the opportunity to review our draft determination and its potential effect on its RAB, turnover and profit. This is because the forecast of these financial balances can affect the valuation of its network for rating purposes and hence the level of business rates in CP5. Table 6.5 sets out our determination of business rates for CP5.

Table 6.5: Our determination of business rates for CP5

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5
Great Britain	151	149	149	149	172	197	577	815
England & Wales	135	133	133	133	154	176	515	729
Scotland	16	16	16	16	18	21	62	85

6.13 Overall our assumptions for business rates of £815m for Great Britain, £729m for England & Wales and £85m for Scotland are respectively higher than Network Rail's SBP forecast by £28m for Great Britain, £24m for England & Wales and £3m for Scotland[119]. This is because we corrected an error in Network Rail's assumptions.

British Transport Police costs

6.14 In support of our assessment of British Transport Police (BTP) costs, we have considered the following evidence:

(a) the Winsor report on the pay and conditions of police officers and staff, which outlined 121 recommendations designed to facilitate an efficient, well-resourced and highly skilled police service with a modern system of remuneration;

(b) the relevant sections of the Rail Value for Money study, which set out recommendations designed to deliver efficiency savings beyond those already planned by the British Transport Police Authority (BTPA). These included:

(i) the transfer of some of BTP's activities to other forces and the sharing of specialist functions and support activities;

(ii) extending efficiency opportunities, including a review of the staffing mix, merging HQ functions and revisions to rostering;

[119] Network Rail's forecasts in its SBP were £787m for Great Britain, £705m for England & Wales and £82m for Scotland.

(iii) local alignment with train operators and infrastructure managers, and a revised service specification procedure; and

(iv) major structural change, such as merging BTP with other forces in Great Britain in order to remove overhead costs, and

(c) discussions with Network Rail, BTP and BTPA, which indicated that there was scope to make improvements in efficiency. However, these initiatives have not been quantified.

6.15 After our consideration of this information and given that Network Rail has provided insufficient justification of its forecasts of these costs in its SBP, we have applied the top-down CEPA/Oxera average[120] to our view of Network Rail's pre-efficient costs (average 3.7% efficiency gain per annum, which equates to a 17.2% cumulative efficiency gain over CP5).

6.16 Table 6.6 sets out our determination of these costs for CP5 including the adjustment for efficiency.

Table 6.6 Our determination of British Transport Police costs for CP5

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5
Great Britain	71	71	68	66	63	61	385	329
England & Wales	66	64	61	59	57	55	348	296
Scotland	7	7	7	7	6	6	37	33

6.17 Overall our assumptions for BTP costs of £329m for Great Britain, £296m for England & Wales and £33m for Scotland are respectively lower than Network Rail's SBP forecast by £26m for Great Britain, £24m for England & Wales and £2m for Scotland[121].

The Railway Safety and Standards Board (RSSB) levy

6.18 We have considered Network Rail's SBP submission for the RSSB levy in CP5. Network Rail has provided insufficient evidence of its forecasts for this area of cost and so we have taken Network Rail's forecast 2013-14 RSSB levy and applied the

[120] This is based on the average of two studies (CEPA 4.4% and OXERA 3.1%).

[121] Network Rail's forecasts in its SBP were £355m for Great Britain, £320m for England & Wales and £35m for Scotland.

top-down CEPA/Oxera average to this forecast (average 3.7% efficiency gain per annum).

ORR licence fee and the railway safety levy

6.19 We have taken the 2013-14 licence fee and safety levy and converted them into 2012-13 prices to be consistent with our determination. The licence fee is paid only by Network Rail whereas train operators contribute to the safety levy, based on their turnover. For our assessment we have allocated a proportion of the safety levy to Network Rail using our 2012-13 allocation because the 2013-14 allocation is not yet known. For our determination we have assumed Network Rail pays the same ORR licence fee and the railway safety levy in each year of CP5 (a combination of the licence fee and its share of the safety levy) as we have forecast for 2013-14.

Other

6.20 For the purpose of our draft determination we have used Network Rail's forecast in its SBP. However, we are reviewing our use of reporters[122] at the moment and will review the forecast for our final determination.

Summary

6.21 Our assumptions on traction electricity, industry costs and rates are summarised in Tables 6.7, 6.8 and 6.9.

[122] Independent reporters are consultancy firms that provide independent expert advice and are used by us to review some aspects of Network Rail's performance, plans and activities, e.g. its financial reporting. They owe a duty of care to both the ORR and Network Rail but Network Rail pays for their costs.

Table 6.7: Our assessment of CP5 traction electricity, industry costs and rates (Great Britain)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5
Traction electricity	238	247	345	378	399	452	1,226	1,819
Business rates	151	149	149	149	172	197	577	815
British Transport Police	71	71	68	66	63	61	385	329
RSSB	9	9	8	8	8	8	46	41
ORR licence fee and railway safety levy	17	17	17	17	17	17	115	86
Other industry costs	5	5	5	5	5	5		24
Total	**491**	**497**	**592**	**622**	**664**	**739**	**2,349**	**3,114**

6.22 Overall our assumptions for traction electricity, industry costs and rates of £3,114m in CP5 for Great Britain is £510m lower than Network Rail's forecast of £3,624m in its SBP. This is largely due to a reduction in traction electricity costs of £524m as we have used a more up to date forecast of electricity prices than Network Rail.

6.23 Our forecast total expenditure on traction electricity, industry costs and rates in CP5 in our determination is £3,114m for Great Britain, which is 8.2% of Network Rail's total expenditure and our advice to ministers assumptions were a low of £2,997m and a high of £3,378m.

Table 6.8: Our assessment of CP5 traction electricity, industry costs and rates (England & Wales)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5
Traction electricity	224	232	321	352	373	424	1,158	1,702
Business rates	135	133	133	133	154	176	515	729
British Transport Police	66	64	61	59	57	55	348	296
RSSB	8	8	8	7	7	7	41	37
ORR licence fee and railway safety levy	19	16	16	16	16	16	100	78
Other industry costs		5	5	4	4	4		22
Total	**452**	**457**	**543**	**572**	**611**	**682**	**2,162**	**2,864**

6.24 Overall our assumptions for traction electricity, industry costs and rates of £2,864m in CP5 for England & Wales is £475m lower than Network Rail's forecast of £3,339m in its SBP. This is largely due to a reduction in traction electricity costs of £490m as we have used a more up to date forecast of electricity prices than Network Rail.

Table 6.9: Our assessment of CP5 traction electricity, industry costs and rates (Scotland)

£m (2012-13 prices)	CP4	CP5					Total	
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	CP4	CP5
Traction electricity	14	15	24	26	26	27	68	117
Business rates	16	16	16	16	18	21	62	85
British Transport Police	7	7	7	7	6	6	37	33
RSSB	1	1	1	1	1	1	5	4
ORR licence fee and railway safety levy	2	2	2	2	2	2	15	8
Other industry costs		1	0	0	0	0		2
Total	**40**	**41**	**49**	**51**	**53**	**57**	**187**	**250**

6.25 Overall our assumptions for traction electricity, industry costs and rates of £250m in CP5 for Scotland is £32m lower than Network Rail's forecast of £282m in its SBP. This

is largely due to a reduction in traction electricity costs of £34m as we have used a more up to date forecast of electricity prices than Network Rail.

7. Operations expenditure

Key messages in this chapter

- Operations costs are those incurred in 'operating' the infrastructure such as for signallers and control staff. Network Rail's main proposal in this area is to implement a new way to run its infrastructure, often referred to as the Network Operating Strategy (NOS).
- The operational benefits of this strategy have the potential to be wide ranging, including reduced safety risk and better management of disruption, with the latter meaning that passengers and freight users should have shorter delays and more accurate information when things go wrong. It should also result in lower costs as fewer posts will be needed.
- We have reviewed Network Rail's proposals against domestic and European benchmarks. We have also conducted our own assessment of whether the strategy can deliver the proposed benefits.
- Network Rail will compare favourably with international benchmarks once the strategy is implemented. The company is at an early stage but the timescales are underpinned by a sensible rationale and consistent with other infrastructure companies that have done something similar. However, the level of efficiency for activities outside signalling are below benchmarks with other UK regulated industries and we think this can be improved.
- We have assumed that approximately £2bn of expenditure is required for CP5 with a cumulative efficiency of 17% in England & Wales and 18% in Scotland, which is an increase from the SBP of four percentage points in England & Wales and three percentage points in Scotland, to bring it in line with domestic benchmarks. We think Network Rail can achieve this through, amongst other things, better management of inflation and better management of occupational health.

Introduction

7.1 Network Rail has started to implement a long-term operating strategy that is introducing modern technology to operate the rail network more efficiently. It will centralise control so that more signals can be operated by fewer people and at fewer

locations. Staff involved in different aspects of operating the railway will be based in the same location and, in many cases, this will be alongside train operators. This will facilitate closer co-operation and in times of disruption allow better joint decisions about managing the train service. For example, better technology and wider coverage of control will help staff to reduce the knock on effects caused by an incident and quickly get services back up and running. In addition to improved reliability the new technology will help Network Rail to plan capacity better meaning that more trains could be introduced. Passengers should also receive better and more timely information about their journey.

7.2 To make this happen, signals need to be controlled remotely which requires widespread deployment of advanced signalling technology across the network. This is planned to be done alongside other renewals, but in order to deliver the strategy an increase in the volume of signalling work of around 20%[123] is needed in CP5. Alongside this signalling work Network Rail plans to centralise staff into 14 new operating centres (Figure 7.1) and introduce modern systems to manage train movements. A number of new centres will be built and a new system to manage traffic will be introduced. Eight of the proposed centres have already been built with the remainder due to be completed over the next two years. All of this combines to allow Network Rail to progressively change the way it operates the network over the next 15 years. It will be done in stages as signalling control is activated at the new centres and staff relocate to them.

7.3 The costs of this work are spread around Network Rail's business, for example updating signalling is part of the signalling renewals expenditure. Both the costs and benefits will influence other elements of the settlement, such as volumes of signalling renewals and levels of train service reliability. These are considered in the relevant chapters of this draft determination.

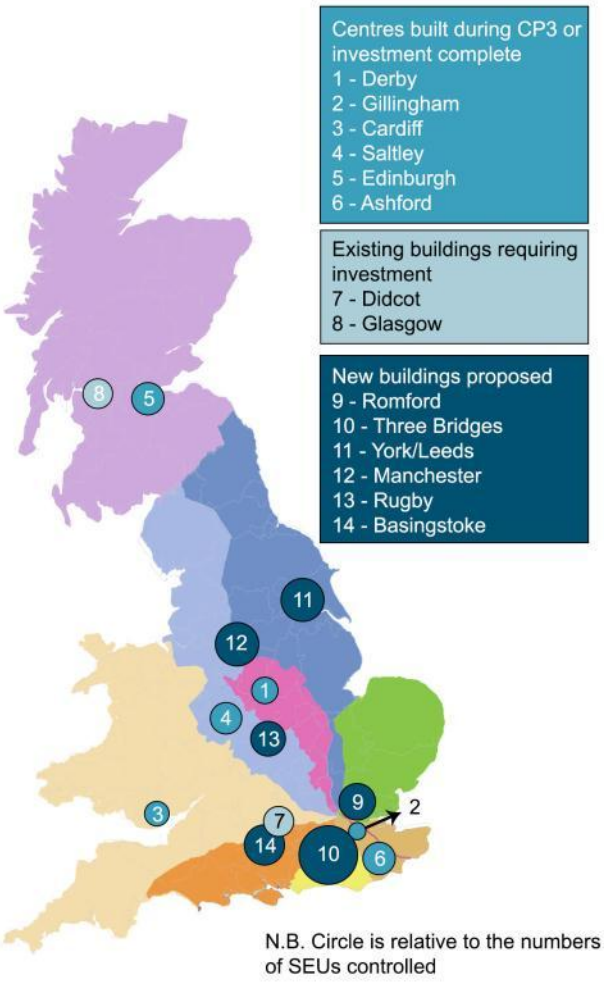
7.4 The main financial benefit will be lower operations expenditure as fewer posts will be required to manage the network. This chapter explains our examination of the operating strategy and presents our conclusions on assumed levels of efficient operations expenditure required for CP5.

[123] As set out in Network Rail's business case supplied in support of the SBP.

7.5 Approximately 70%[124] of operations costs are affected by the operating strategy. We have assessed all operations costs but with a particular focus on those affected by the strategy.

7.6 From our previous consultations it is clear that the industry is broadly supportive of the strategy, although it is at an early stage and several parties have expressed caution. The RMT set out general opposition to various elements of the SBP, including the operations strategy. Network Rail is working with the main unions in developing the strategy and we explain in chapter 11 our conclusion that there is nothing in the determination that prevents Network Rail complying with Health and Safety law.

Figure 7.1: New operating centres proposed in the SBP*



[124] From the costs supplied by Network Rail proposed signaller costs for CP5 are £1,365m from a total of £2,027m.

* SEUs are the signalling equivalent units which can be used as way of illustrating the span of control for each operating centre

Description of operations costs

7.7 Operations costs include expenditure on activities that 'operate' the infrastructure to allow trains to run such as signalling, timetabling and managing disruption. Costs are broadly categorised as:

(a) 'signaller', including signallers, level crossing keepers, controllers and electrical control room operators, which are affected by the operations strategy; and

(b) 'non-signaller', including staff on the ground managing disruption, staff in the managed stations, teams attributing delays and those dealing with customer relations, which are directly affected by the operations strategy.

7.8 The SBP identified an additional category 'Central Network Operations', which include centralised functions such as timetable management and performance management. For our assessment we have considered these with the non-signaller costs and refer to them as such.

Network Rail's proposals

7.9 The SBP sets out Network Rail's operations expenditure for CP5. Some maintenance costs, such as maintenance at stations, were included because they are costs managed by the operations function. Because of the way we have assessed the level of efficient expenditure we have removed maintenance costs from our operations assessment and included them in our maintenance assessment.

Table 7.1: Summary of Network Rail's SBP proposal for GB expenditure (with maintenance costs)

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	439	439	439	439	439	439	-	2,195
Annual efficiency	-	0.9%	2.1%	3.5%	2.9%	4.0%	-	12.8%
Post-efficient expenditure	439	435	426	411	399	383	2,239*	2,054

* Taken from appendix 9 of the SBP databook which updates actual and forecast expenditure in CP4 and replaces the delivery plan update.

Table 7.2: Summary of Network Rail's SBP proposal for GB expenditure (without maintenance costs)

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	433	433	433	433	433	433	-	2,165
Annual efficiency	-	0.7%	2.1%	3.6%	3.2%	4.1%	-	12.9%
Post-efficient expenditure	433	430	421	406	393	377	2,239*	2,027

* Taken from appendix 9 of the SBP databook which updates actual and forecast expenditure in CP4 and replaces the delivery plan update.

Signaller costs

7.10 Reductions in signaller costs will happen when existing signalling control is transferred to the new centres as part of the operating strategy. While Network Rail has started to implement some of the elements needed, there remain a number of key dependencies affecting the rate of change, such as: the ability of Network Rail and its supply chain to complete the required signalling renewals; and the company's approach to redeployment and redundancy in consultation with the trade unions. Network Rail has devised a programme for staffing the operating centres that it considers is the most efficient approach taking account the constraints. This

programme drives the rate of cost reductions and consequently the levels of efficiency it can achieve in CP5.

7.11 The strategy will be delivered by many different parts of Network Rail and is coordinated centrally. The specific reductions in signaller costs will be delivered by each of the routes and were set out in the route plans.

Non-signaller costs

7.12 Costs for the non-signaller activities in the routes remain broadly static in CP5 but there is a small efficiency saving on costs related to Network Operations HQ activities. This will mainly be the result of an initiative to improve the way Network Rail plans access and possessions.

Benchmarking

7.13 In developing its plans Network Rail carried out some work to benchmark the operational cost of running the railway infrastructure in Great Britain against other European railway operators. We reviewed[125] this work and found that the task was approached thoroughly but there were a number of areas that could be strengthened, particularly around including non-signaller costs in the benchmarking, as well as considering internal comparisons of its own routes. Network Rail responded positively to these recommendations and revised its work accordingly. The revised findings were inconclusive but indicated that Network Rail is not currently at the frontier in terms of operations expenditure but implementing the operations strategy would take it closer.

Progressive assurance

7.14 We put in place a number of assurance meetings in the period running up to the SBP and Network Rail worked openly and constructively. As a result the information provided in support of the SBP was in the format and to the level of detail that we required for our assessment.

Our assessment

7.15 Network Rail's plans set out a new way to run its infrastructure. We reviewed this to determine efficient levels of expenditure required for CP5. We tested different aspects

[125] Network Rail bottom up benchmarking review: benchmarking of operations costs: final report – executive summary, March 2012, available at: http://www.rail-reg.gov.uk/pr13/PDF/arup-operations-costs-benchmarking-020312.pdf.

of its proposals and commissioned our own work from which to draw conclusions. We removed the maintenance costs for the purposes of our assessment to avoid double counting with our review of maintenance expenditure explained in chapter 8.

Review of the operations strategy economic case

7.16 In our advice to the Secretary of State and Scottish Ministers we reviewed the initial business case and concluded that the rationale was sound. We told Network Rail to update the business case for the SBP submission and reformat it to take into account the strategic, financial, commercial and management cases as well as the economic case. Whilst the business case is GB wide the elements within it are disaggregated for Scotland and England & Wales. We checked the way that the economic appraisal had been calculated against standard industry practices (webTAG in England & Wales and STAG in Scotland) and concluded that the revised case still provides good value for money in both Scotland and England & Wales, with both countries having a benefit cost ratio of 3:1.

Review of the operations strategy management case

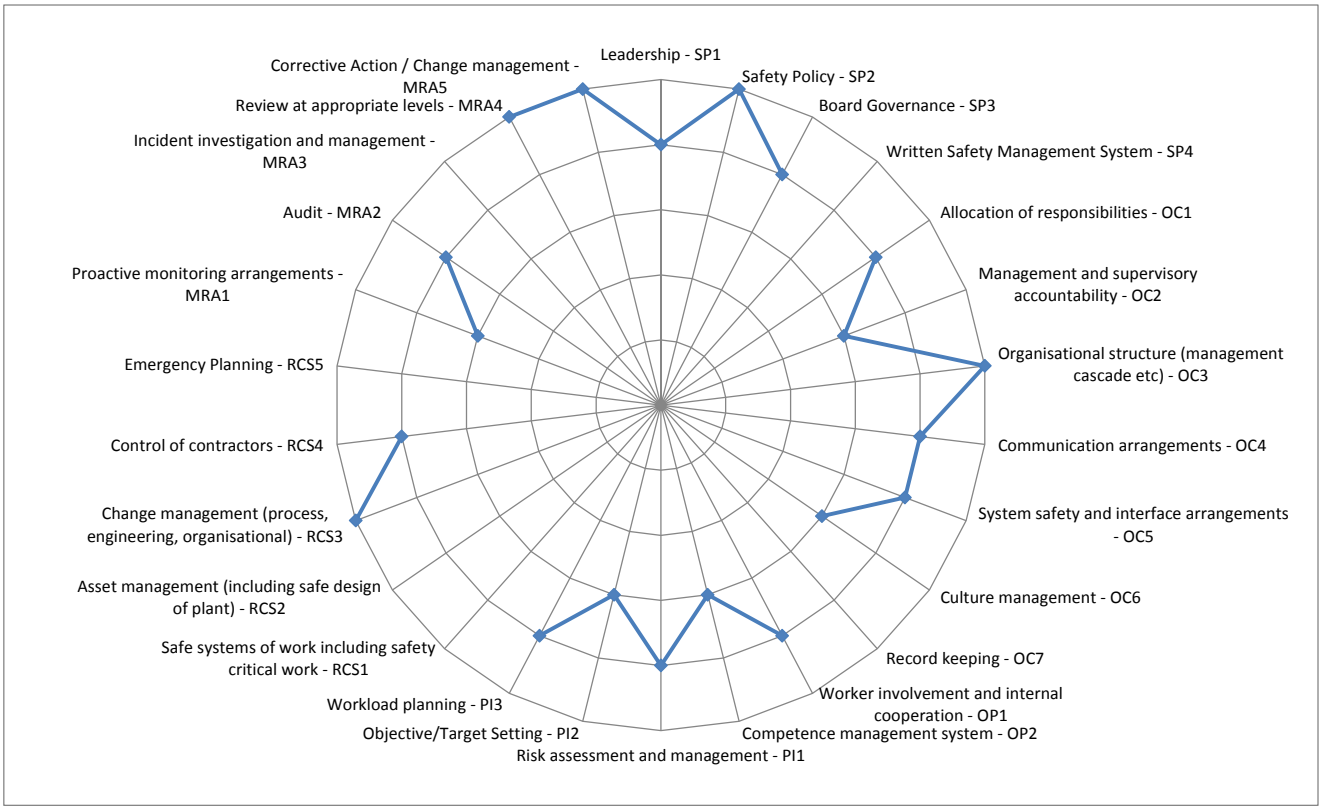
7.17 Using our Rail Management Maturity Model (RM3)[126] we evaluated the capability of Network Rail to deliver the operating strategy and associated reduction in headcount. An ORR team of experts was used who have experience of applying this model to the safety management of a number of rail industry organisations. A five point scale was applied to a number of categories based on the team's judgement of the evidence collected. Further detail on the evaluation criteria can be found on our website[127].

7.18 We found areas where we considered there was the potential to deliver excellence (level 5), in particular, governance, monitoring and review. Other areas were considered to be predictable (level 4) or standardised (level 3) with none at levels 1 or 2. These are summarised in Figure 7.2. We concluded that if performance in the excellent areas is maintained and improvements made in the other areas then the systems are capable of allowing successful delivery of the operating strategy programme. We also concluded that the way the programme has been planned and the systems developed offers Network Rail examples of excellence which should be shared through the organisation.

[126] http://www.rail-reg.gov.uk/pr13/PDF/nr-rm3-evaluation-sep2012.pdf.

[127] http://www.rail-reg.gov.uk/upload/pdf/management-maturity-model.pdf.

Figure 7.2: Summary of our RM3 assessment (the outside of the wheel is level 5 excellent)



Review of CP4 signalling volumes

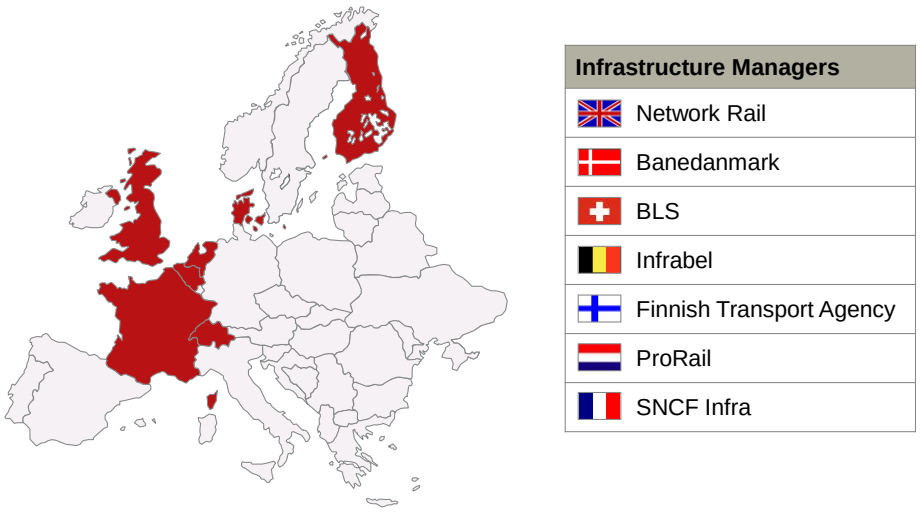
7.19 The main constraint in delivering the strategy is the rate at which the volume of signalling renewals can be done with Network Rail's own resources and those of its supply chain. It has devised a programme that accelerates signal renewals to align them with plans to migrate staff to the new control centres. Network Rail is broadly on course to deliver its CP4 volumes, although there is a peak of work required over the next year. For CP5 the total amount of work will almost double and, in CP4, testers[128] have been a scarce resource. Wherever possible, Network Rail has smoothed the profile and identified the times when it expects testers to be in short supply. Further explanation of our analysis of signalling volumes is set out in the renewals section of chapter 8.

[128] These are staff required to check that new or renewed signals function as designed and in a safe way.

International benchmarks

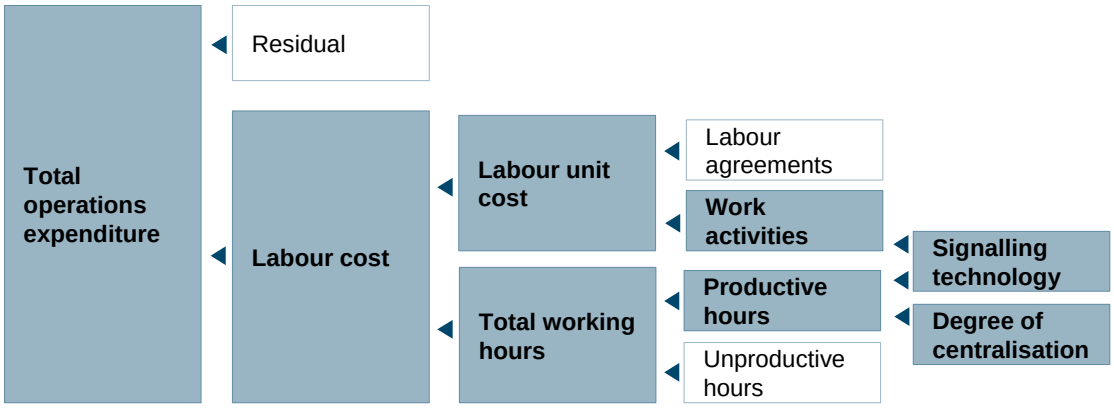
7.20 Network Rail's own work on benchmarking was inconclusive, although we acknowledge the difficulties around benchmarking operations costs. We commissioned the management consultants Civity to benchmark Network Rail's operations (and support) costs against other European railway infrastructure managers to see how they compare. This work was designed to build upon Network Rail's own work and other analysis done for the Rail Value for Money study. It looked at total operations costs, i.e. both signaller and non-signaller.

Figure 7.3: European comparisons used in the Civity review



7.21 Six peers agreed to take part in the study and provided comparable data, shown in Figure 7.3. From this data Civity concluded that most programmes that are similar to Network Rail's operating strategy take 15-20 years to implement. The analysis also showed that on completion of the operating strategy Network Rail would be at a leading position compared to this peer group in terms of cost efficiency. Figure 7.4 shows the areas that Civity analysed to inform its conclusions.

Figure 7.4: Scope of the Civity review



Comparisons with UK regulated industries on catch up and frontier shift

7.22 In March 2012, we published a report[129] by CEPA on the assessment of the scope for efficiency improvements based on comparisons with other UK regulated industries. This concluded that an appropriate annual target for CP5 would be 4.4% per annum for both support and operations costs. Network Rail completed its own review of this study using OXERA and included the findings alongside its SBP submission, which was a central estimate of 3% per annum. As we set out in chapter 6 (support expenditure), we have decided to use the average of these two studies as our top-down efficiency assumption.

Table 7.3: Comparisons of Network Rail's SBP cost efficiencies with other UK regulated industries

GB (2012-13 prices)	End CP4 (2013-14)	End CP5 (2018-19)	Cumulative Efficiency
Mid-point between CEPA and OXERA analysis			**17%**
Signaller costs in SBP	£298m	£246m	17%
Non signaller costs in SBP	£135m	£131m	3%

Our conclusions

7.23 Table 7.4 summarises our conclusions on the assumed level of efficient operations expenditure for Great Britain. We have assumed that approximately £2bn of expenditure is required for CP5 with a cumulative efficiency of 17% in England &

[129] http://www.rail-reg.gov.uk/pr13/PDF/cepa-orr-om-productivity-over-cp5.pdf

Wales and 18% in Scotland, which is an increase from the SBP of four percentage points in England & Wales and three percentage points in Scotland.

Table 7.4: Summary of our assumptions for operations expenditure – Great Britain

£m (2012-13 prices)	SBP	ORR determination	Difference
Signaller expenditure	1,366	1,366	0
Non signaller expenditure	661	606	-55
Overlay for cross cutting issues	-	-4	-4
Total	**2,027**	**1,968**	**-59**

Signaller expenditure

7.24 Network Rail is at the start of its programme to change the way it operates the network. We have reviewed the business case and concluded that it represents value for money.

7.25 We agree with the international benchmarking analysis showing that, compared to a group of European peers, Network Rail will be at a leading position once the strategy is completed in terms of costs and staff productivity.

7.26 We looked at whether Network Rail had the right approach to deliver the strategy. Using our own management maturity model we concluded that the current management arrangements should lead to successful delivery. However, the programme is at an early stage and there are risks from introducing new technology that need to be managed. Whilst not a regulated output, progress will be an important issue for PR18 and we have decided to monitor this throughout the control period. We have also decided that Network Rail should report on progress in its Annual Return.

7.27 We considered whether there was scope to accelerate the programme and therefore bring about more cost savings earlier. In comparing Network Rail to its European peers we found that the expected time span to deliver the strategy is in line with other countries that have embarked on something similar. We also looked at the high level programme where the main constraint is Network Rail's ability to deliver signalling renewals and re-control and have concluded that, at this stage, these cannot be accelerated any further. However, as the overall strategy will continue into CP6 and CP7 we will revisit this in the next periodic review when the programme will have matured and Network Rail has learnt from its experiences.

Non signaller expenditure

7.28 Compared to other regulated industries within the UK we have concluded that the level of efficiency for non-signaller expenditure can be improved, so we applied our top-down efficiency assumption to these costs.

Cross cutting issues

7.29 In addition we also think that Network Rail can make savings from cross cutting issues explained in chapter 4, i.e. better management of inflation and better management of occupational health.

Comparisons with RVfM and advice to ministers documents

7.30 The RVfM study examined the operating strategy and concluded that it was an opportunity to improve VfM. It did not make any additional recommendations in this area and did not include any further cost reductions in its calculations over and above those delivered by the strategy.

7.31 In comparison to our advice to minsters documents our assumptions on total expenditure is about 1% above the range we set out for Great Britain, with costs in Scotland 2% below the range and costs in England & Wales 2% above it. This is largely because the pre-efficient expenditure in the SBP, i.e. the 'starting point' from which to apply efficiency, was much higher than the IIP for England & Wales. Our assumed level of cumulative efficiency is in the middle of our initial range in England & Wales (which was 11% to 21%) and significantly above the range in Scotland (which was 3% to 8%).

Great Britain

Table 7.5: Summary of our assumptions for operations expenditure – Great Britain

£m (2012-13 prices)	CP4		CP5				CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	433	433	433	433	433	433	-	2,165
Annual efficiency	-	2%	3%	4%	4%	5%	-	17%
Post-efficient expenditure	433	425	412	395	378	358	2,239	1,968

England & Wales

Table 7.6: Summary of our assumptions for operations expenditure – England & Wales

£m (2012-13 prices)	CP4		CP5				CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	393	393	393	393	393	393	-	1,965
Annual efficiency	-	2%	3%	4%	4%	6%	-	17%
Post-efficient expenditure	393	385	374	358	344	325	2,034	1,787

Scotland

Table 7.7: Summary of our assumptions for operations expenditure – Scotland

£m (2012-13 prices)	CP4		CP5				CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	40	40	40	40	40	40	-	200
Annual efficiency	-	1%	4%	4%	7%	4%	-	18%
Post-efficient expenditure	40	39	38	37	34	33	205	181

8. Asset management: maintenance and renewals expenditure

Key messages in this chapter

- This chapter covers our assessment of Network Rail's plans for managing its assets, for example its plans for maintaining and renewing track.
- How Network Rail manages its assets is closely linked to the safety of the railways, and will have a major impact on what outputs it can deliver and at what cost not only in the next 5 years but over the longer term.
- The costs associated with maintaining and renewing assets make up approximately 45% of Network Rail's total expenditure requirements in CP5.
- We, supported by the independent reporters, have carried out a comprehensive review of Network Rail's plan including the quality of its inputs (for example, asset base and cost information), its asset management approach (for example, its asset policies), its planned efficiency and its planned volumes, costs and outputs. We have also conducted our own international efficiency and benchmarking studies, looking at working practice and cost comparisons.
- Network Rail's maintenance and renewal plans are an improvement over PR08. The asset policies set a clearer direction in terms of what work needs doing, why and where.
- Plans have been submitted for each of Network Rail's ten operating routes. They have been produced by a process of challenge between the centre and routes which has resulted in better plans than would otherwise have been available.
- But there are areas of weakness which cut across the whole approach. For example: asset information management requires improvement; asset policies have not considered trade-offs between asset types; whole life costing analysis is crucially important and needs strengthening by improving its inputs (unit costs and understanding of degradation); Network Rail has more to do to understand how its asset management links to the delivery of high level outputs such as performance; and policies are weaker in defining the maintenance interventions and intervals required.

- Because Network Rail's knowledge of its civils assets and some aspects of its electrification and drainage assets is poor, there is higher uncertainty in parts of its plans.
- **Maintenance**
- Maintenance work is crucial to safety and performance on the network. Plans should be built on a strong understanding of what work needs to be done (for example, the miles of track to be inspected). This can then be priced using current understanding of the costs of carrying out work and the future reductions in cost because of improved efficiency.
- But Network Rail has built its plans by projecting forwards its current resource requirements, with adjustments for the changing network and improved efficiency. It has not clearly demonstrated that its plans are linked to the work required. This means that line of sight to its policies and the outputs that the company needs to deliver, is weak.
- Our analysis finds that, over CP5, maintenance efficiencies of 10.4% are achievable, compared with 9.8% assumed by Network Rail. The higher efficiency is driven by better management of resource. We have assumed a different profile of efficiency, giving 16.5% efficiency by the final year of CP5, compared with 13.7% assumed by Network Rail. We do not believe savings can be made beyond 16.5%, partly because of our concern about how rapidly Network Rail can introduce changes without potentially compromising safety or performance.
- Overall we assess that Network Rail needs to spend £5.2bn on maintenance during CP5, £92m less than proposed in the SBP.
- This means that Network Rail will have to implement changes to its practices, such as carrying out more automated inspections, making sure the right work is done at the right location at the first visit and making sure that working arrangements allow most productive use of time.
- **Renewals**
- Network Rail's renewal plans have, in general, a strong linkage to asset policies. They are built on a combination of workbanks in the shorter-term and modelled volumes in the longer term.
- Some key national programmes of work have been proposed to deliver long-term improvements and efficiencies, and we support these. They include the Network Operation Strategy (NOS) to centralise signalling and electrical control, a programme

to update the signalling system (by moving to the European Rail Traffic Management System (ERTMS)), and programmes aimed at improving asset management capability through improved asset information management (ORBIS), improved buildings and civils management (BCAM) and wider adoption of best practice asset management.

- Network Rail has conducted benchmarking to support its efficiency plans. This included a programme of international benchmarking of engineering practice which is far more extensive than it has ever previously carried out.
- But there are weaknesses in Network Rail's proposals. Its calculation of its current unit costs contains some errors and makes allowances for risk and contingency which are likely to be overestimated or duplicated. For buildings the proposed level of expenditure before efficiencies is not justified. For civils there are wide ranging issues that need to be addressed to produce a robust plan.
- Our analysis finds that, over CP5, renewals efficiencies of 14.7% are achievable, compared with 12.5% assumed by Network Rail. Our analysis finds that efficiencies of 20.1% are achievable by the final year of CP5, whereas Network Rail has proposed equivalent efficiencies of 15.7%. We have assumed greater opportunities from improved management of possessions, improved management of the supply chain, improved asset management systems, better targeting of work and adoption of innovative renewals practices.
- Overall we assess that Network Rail needs to spend £12.2bn on renewals during CP5. This is £1.6bn less than proposed in the SBP.
- Network Rail's management of its civil engineering assets (such as bridges and tunnels) has been a long-running issue. In 2010 concerns about its approach led to us and Network Rail commissioning Arup to carry out a fundamental review. Arup found widespread issues and made recommendations, for example, to improve asset policies, asset information, assessment of risk and resources. The company has started to make significant improvements and this is reflected in its proposed CP5 policies. However, there remains a lot more to be done. It has not presented a complete or consistent set of plans, some parts of the plans were submitted late and they contained many errors.
- Network Rail proposed expenditure of £2.6bn on civils renewals during CP5, whereas we have assessed expenditure required to be £2.4bn. However, there is high uncertainty around the civils plans and we agree with Network Rail that civils should

be dealt with differently. Recognising that the volume of work needs to increase we will provide increased funding (compared to CP4) for the first two years of CP5 where plans are relatively better. For years 3, 4 and 5 of the period we have assumed an increased level of expenditure but actual funding will be assessed by the 'civils funding mechanism' which requires Network Rail to submit further plans in the first year of CP5. This will allow both what work is planned and the efficiency of that work to be checked and adjusted accordingly.

Introduction

8.1 It is very important that Network Rail is capable of managing its assets effectively, including planning and delivering appropriate maintenance and renewal works. Effective asset management helps to deliver a safe, efficient railway which delivers the outcomes that stakeholders want, both now and in the future.

8.2 Our PR13 work has reviewed many aspects of Network Rail's asset management in great detail. We have assessed its development of asset management plans, from the definition of high level strategy, through development of asset policies to the planning of maintenance and renewal work in the routes. We have assessed the inputs to its plans: the asset information and understanding of costs that underpins them. We have also taken account of the company's delivery of work during CP4.

8.3 This chapter starts by giving a summary of Network Rail's CP5 plans for maintaining and renewing its assets safely, including:

(a) an overview of its asset management plans, including its planned asset management capability improvements, key asset management programmes of work and new asset policies;

(b) an overview of its process for development of planned volumes and expenditure; and

(c) a summary of its projected volumes and costs to maintain and renew the network, and forecasts of measures to demonstrate what the work delivers.

8.4 The chapter then presents our assessment of Network Rail's plans, including:

(a) our approach to the assessment of efficient maintenance and renewal expenditure;

(b) our assessment of each of the building blocks of Network Rail's maintenance and renewals plans;

(c) our assessment by main asset category and by route;

(d) our conclusions on the efficient volumes of maintenance and renewal work and associated efficient expenditure required in CP5.

8.5 Our work in this area is supported by extensive independent reporter work.[130] The associated reports are published on our website. We have considered the reporters' findings in developing our view of maintenance and renewal efficient expenditure requirements for CP5.

Our presentation of expenditure and efficiency in this chapter

Expenditure

8.6 We present all CP4 expenditure on the basis of regulatory accounting in CP4 and therefore on the same basis as Network Rail presented its planned CP4 expenditure in its SBP. We exclude the £250m expenditure associated with accelerating civil engineering works from CP5, which formed part of the additional investment measures announced by the UK Government in its Autumn 2011 budget statement.

8.7 We present all CP5 expenditure on a slightly different basis to CP4. In CP5, works which have previously been treated as renewals expenditure, but which are associated with small scale works on buildings and civil engineering structures, will be treated as maintenance costs to align with Network Rail's statutory accounts. These works are termed 'reactive maintenance'. In its SBP Network Rail moved some of these costs from renewals to maintenance (approximately £250m over the control period associated with the Civil Engineering Framework Agreement (CEFA) contract, discussed later in this chapter). We have made a further adjustment to include all reactive maintenance costs as maintenance expenditure. We have assumed that reactive maintenance costs are 4% of total renewals costs and applied the adjustment as a high level overlay to be transparent. This results in a post-efficient movement of £507m from renewal to maintenance between the two control periods. We will refine

[130] http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php

this adjustment for final determination. To provide a valid comparison we have applied this to both Network Rail's figures and our own from CP5 onwards.

Efficiency

Maintenance

8.8 In its SBP Network Rail presented its maintenance efficiency plans using the final year of CP4 as a baseline. We are also using the final year of CP4 as a baseline but we have made adjustments so that it represents the position before efficiencies more accurately. We have:

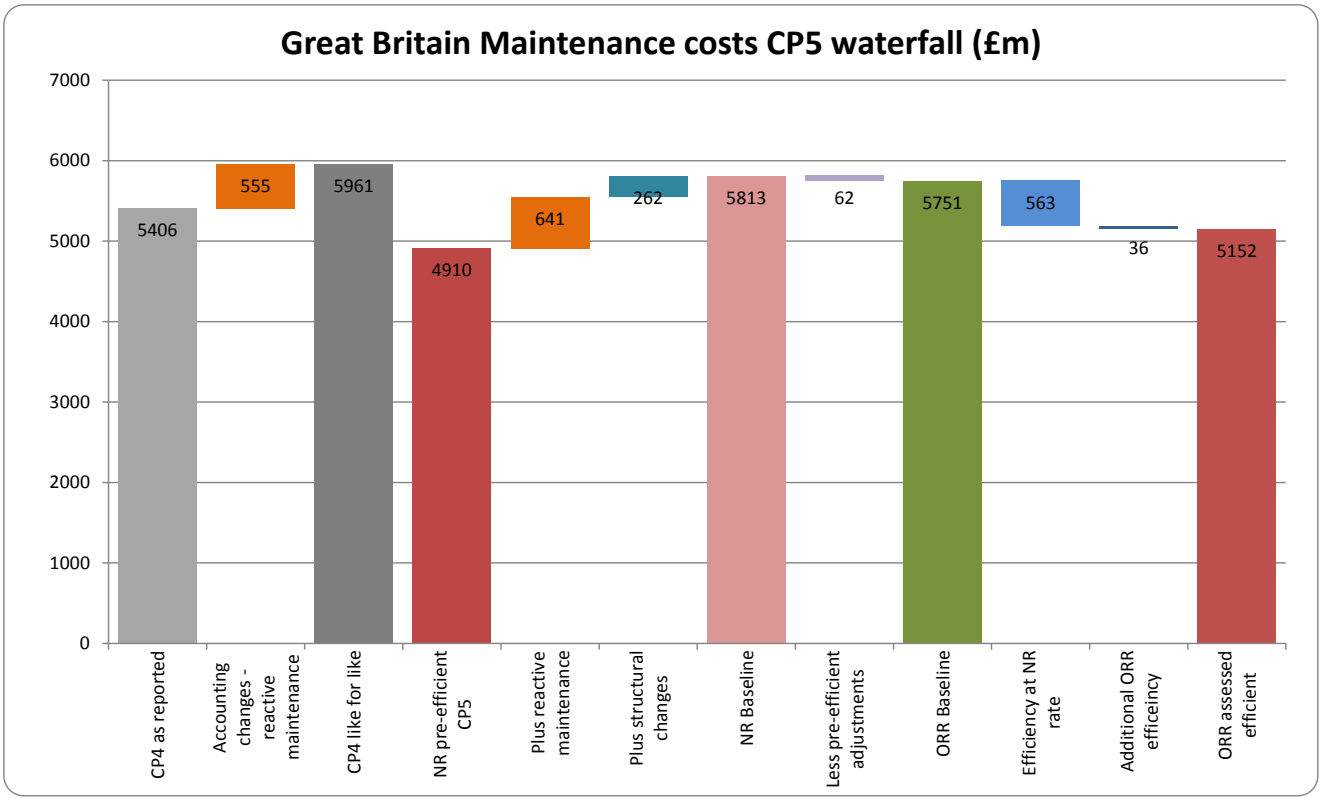
(a) added reactive maintenance costs as discussed above;

(b) increased the baseline on a yearly basis for 'structural factors'. This increase is to take account of the increased traffic and enhancement projects which will drive the need for more maintenance works and to exclude 'special projects' from the baseline which are not of representative of on-going expenditure requirements; and

(c) reduced the reactive maintenance part of the baseline for issues identified in how these costs have been forecast.

8.9 These adjustments create the 'ORR baseline' against which we have calculated our assessed efficiencies.

Figure 8.1: Our presentation of maintenance efficiencies in CP5*



*Note: This chart is a simplified representation based on a number of high-level assumptions and will not fully reconcile to all relevant tables.

Renewals

8.10 In its SBP Network Rail presented its renewals efficiencies against a pre-efficient baseline representing the volumes of work required by its new CP5 asset policies (discussed later in this chapter) and its assumed costs at the end of CP4. The new policies are intended to deliver sustainable outputs more efficiently, and therefore there are efficiencies embedded in its SBP pre-efficient expenditure. It presented its renewals efficiencies for certain key asset types. We have adjusted Network Rail's SBP pre-efficient baseline by:

(a) removing reactive maintenance costs as discussed above;

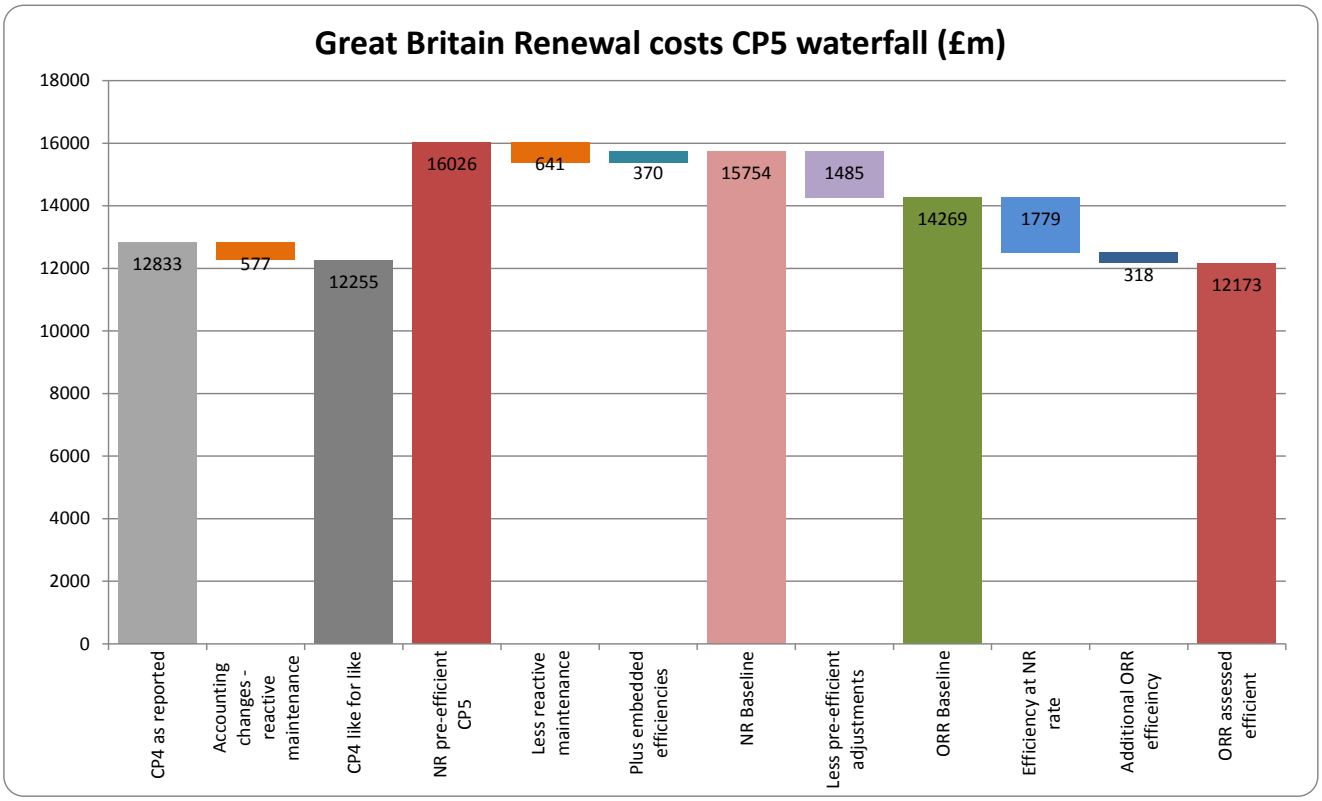
(b) adding on those efficiencies which we have assessed to be embedded in its asset policies to give a 'Network Rail baseline';

(c) making reductions to the Network Rail baseline to reflect our assessment of its pre-efficient plans giving the 'ORR baseline'; and

(d) considering efficiency across all types of renewal expenditure, not just for certain asset types.

8.11 We have presented Network Rail's proposed efficiencies as the difference between the Network Rail baseline and the post-efficient costs in the SBP. We have presented our assessed efficiencies as the difference between the ORR baseline and our assessed post-efficient expenditure. Our approach to renewals assessment is shown in Figure 8.2.

Figure 8.2: Our presentation of renewals efficiencies in CP5*



*Note: This chart is a simplified representation based on a number of high-level assumptions and will not fully reconcile to all relevant tables.

Network Rail's proposals for management of its assets

8.12 Network Rail is improving its asset management capability and plans to improve further in the remainder of CP4 and CP5. It has set out its key initiatives for CP5, including:

(a) optimisation of asset policies;

(b) further development of risk-based maintenance;

(c) improved asset information;

(d) further rollout of remote condition monitoring;

(e) development of the Asset Management Services (AMS) organisation; and

(f) development of improved asset management competence and culture.

8.13 Network Rail's SBP submissions are based on the new and improved ways of managing its assets which will be delivered by asset management capability improvements from specific programmes of work. The key programmes are set out below.

Asset Management Improvement Plan (AMIP)

8.14 We have consistently stressed the importance of Network Rail developing its asset management capability. Since 2006 we have measured this using the Asset Management Excellence Model (AMEM). Early in CP4 we and Network Rail agreed targets for improved capability as measured by AMEM to be delivered by the end of the control period. Network Rail set out how it would deliver these in its Asset Management Improvement Plan (AMIP). We have been monitoring progress against the agreed targets. Whilst Network Rail is delivering real improvements it is behind the targets in key areas and must catch up to deliver our requirements for the end of CP4.

8.15 The company has set out its proposed trajectory for further improved capability in CP5 as discussed in chapter 3. In summary it is proposing continued improvement to reach an average AMEM score of 73% at the end of CP5.

Offering Rail Better Information Services (ORBIS)

8.16 Good asset information management is essential to good asset management. We have pressed Network Rail to develop and implement plans for improved data quality, including improved processes for the collection, management and reporting of data and improved asset information systems.

8.17 Network Rail has acknowledged the need for better asset information management and has proposed a large investment in an improvement programme, Offering Rail Better Information Services (ORBIS). This includes the Asset Data Improvement Programme (ADIP) aimed at delivering asset information improvements in the short-term, to improve inputs to the planning process for CP5. Its proposed investment in ORBIS is £173m in CP5. This investment is forecast to deliver wide ranging benefits, including £270m of efficiencies within CP5. We consider these in our assessment of efficiencies.

8.18 Since publication of the SBP, Network Rail has written to us to set out the key milestones associated with ORBIS which it intends to use to monitor progress. As set out in chapter 3, we will monitor delivery of these milestones as regulated outputs.

8.19 Network Rail's asset data feed into its asset policy modelling and workbank development. We have audited the quality of these data as discussed in more detail later in this chapter.

Buildings & Civils Asset Management transformation programme

8.20 In summer 2010, we and Network Rail commissioned a comprehensive independent reporter study into all aspects of civil structures management in response to evidence of poor practice, including:

(a) Network Rail's difficulty in producing a credible PR08 civil structures and earthworks expenditure programme;

(b) its declaration that it could not guarantee sustainable stewardship beyond CP6;

(c) three bridge failures within an 18 month period; and

(d) the serving of a safety improvement notice on the Southern route. (Subsequently other improvement notices were served network-wide.)

8.21 The resulting report[131] revealed numerous shortfalls in efficient, effective stewardship and recommended a 77 point improvement plan. Network Rail accepted this and has now converted it into a detailed action plan, the Buildings & Civils Asset Management (BCAM) transformation programme. We are monitoring its delivery.

8.22 Improvements arising from the review have included better asset knowledge, the new civil structures and earthworks asset policies that have been used for the SBP submission, and a review of appropriate staffing levels. These have all influenced Network Rail's proposals for civils maintenance and renewal expenditure in CP5. The improvements must be embedded in the routes throughout the control period.

Network Operating Strategy

8.23 Network Rail's plans include proposals for investment of £1,485m to deliver NOS. £876m of this is expenditure to accelerate signalling renewal work, over and above the work required due to condition. The investment will centralise signalling and

[131] http://www.rail-reg.gov.uk/upload/pdf/reprters-audit-rev-policy-arup-mar11.pdf.

electrical control to 14 control centres. The plans indicate that this investment will result in operational efficiencies. Our review of the NOS business plan, including the associated efficiencies, is discussed in more detail in chapter 7.

Intelligent Infrastructure

8.24 Intelligent infrastructure is Network Rail's initiative to increase its Remote Condition Monitoring (RCM) of assets. RCM uses technology to detect asset degradation, making it possible to defer intervention until shortly before assets fail. Network Rail has started implementing this technology during CP4 and plans to increase its rollout in CP5 to cover further signalling, telecoms, and electrification and plant assets. Since publication of the SBP the company has written to us setting out some further details of the volumes of assets to be fitted with RCM over CP5. We expect Network Rail's milestones associated with intelligent infrastructure to be set out fully in its delivery plan and will monitor delivery of these as indicators.

8.25 The CP5 plans include expenditure of £95m on intelligent infrastructure.

New asset policies

8.26 Network Rail's asset management capability improvements have driven some significant improvements in its business planning. In particular the company has produced a suite of new asset policies which set out how it will manage its assets in CP5. The policies provide a framework to plan the volume of work activity that Network Rail considers is appropriate to manage its assets safely, efficiently and sustainably, whilst meeting the required outputs.

8.27 The new policies are set out in a consistent format using a 10 stage framework:

(i) asset description;

(ii) historical analysis;

(iii) asset criticality;

(iv) route criticality;

(v) asset degradation;

(vi) intervention options;

(vii) planning and funding scenarios;

(viii) model development;

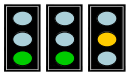
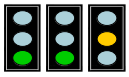
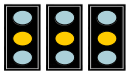
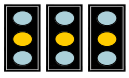
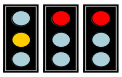
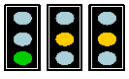
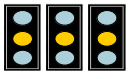
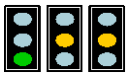
(ix) investment options; and

(x) policy selection.

8.28 Network Rail has, for the first time, developed a suite of whole life cost models to support its asset policies. The policies set out the asset specific outputs which it believes will be delivered by the proposed interventions.

8.29 The company has set out its own analysis of the robustness, sustainability and whole life cost efficiency of its policies. It has assessed the extent to which its route maintenance and renewal plans align with central policy. Its findings are summarised below. We set out our assessment of asset policies later in the chapter.

Figure 8.3: Network Rail's assessment of its asset policies

Asset	Policy maturity (Robustness / sustainability / efficiency)	Alignment of route renewal plans with policy	Alignment of route maintenance plans with policy
Track			
Signalling			
Structures			
Earthworks			
Drainage, fencing and other off-track			
Electrical Power			
Telecoms * Centrally developed plan by Network Rail Telecoms			
Buildings			

8.30 Network Rail does not consider that any of its CP5 asset policies has been demonstrated to meet all three tests of robustness, sustainability and efficiency. It considers the track and signalling policies to be the most mature and structures, earthworks, drainage and telecoms to be less mature. It recognises that its structures policy is not yet fully aligned with route renewal plans.

8.31 We summarise key features of the CP5 asset policies below.

Track asset policy

8.32 Track assets include rail, sleepers, ballast, plain line, and switches and crossings (S&C).

8.33 Network Rail's CP5 track policy is a refinement of current policy, applying differing intervention options depending on the performance requirements of different parts of the network. This is achieved by moving from the current banding of routes into four 'quadrants' to the new policy of using five 'criticality bands'. The policy promotes a focus on high specification interventions, such as full renewal, for track on more critical routes and a greater focus on refurbishment and maintenance to extend asset lives on lower criticality routes. Whole life costing has been applied to help define the optimum intervention regime.

8.34 The policy introduces a move from more manual based inspections towards greater use of automated train-borne inspection and measurement and improved assessment of ballast, formation and drainage condition. On the back of improved information it aims to deliver better planning and targeting of work, including better use of wheeled plant (such as high output track renewals plant). The policy requires a move towards preventative maintenance addressing root causes and a risk based approach to inspection and maintenance. The track policy is supported by the new drainage policy.

8.35 Network Rail forecasts that the condition and performance of track will be maintained both in the short- and long-term. Ballast fouling and S&C condition are expected to improve. The policy is predicted to result in a steady state or reduced number of safety related track infrastructure failures such as rail breaks and geometry faults, with priority given to high criticality routes and critical S&C.

Off-track asset policy

8.36 The off-track asset policy addresses the management of boundary fencing and vegetation. This is the first time that the off-track policy has been produced as a separate document. (Management of these assets was previously included in the track policy.)

8.37 The policy requires more proactive management of fencing and vegetation, rather than the reactive approach that has been prevalent in CP4. Network Rail plans to improve a significant percentage of the asset and this has resulted in a substantial investment in off-track assets being proposed for CP5.

8.38 The policy for boundary fencing aims to reduce unauthorised access and thereby reduce the safety and performance risk to the railway. It is supported by improving asset knowledge which has allowed modelling of renewal and maintenance volumes and has led to an improved specification of materials. This should result in better whole life costs while ensuring that the most appropriate fencing is used, taking account of current and future adjacent land use.

8.39 The policy for vegetation management requires a proactive, cyclical approach to manage vegetation sustainably and to manage risks such as obscured signals, leaves on the line, damage to structures and falling trees. It specifies a range of interventions, ranging from routine maintenance to highly mechanised or chemical treatment.

8.40 Network Rail forecasts that its off-track policy will deliver boundary measures that meet its legal obligations and in doing so proactively manages the safety and performance risks posed by unauthorised access to the railway by people or animals. It will also manage vegetation, through a cyclical maintenance regime, in a way which best supports safe and punctual rail operations.

Signalling asset policy

8.41 The CP5 signalling asset policy covers the management of signals, their control and communication systems, interlockings (which ensure trains are routed safely), points, train detection and level crossings. Level crossings are also the subject of a separate policy which primarily addresses the management of safety risk.

8.42 The policy has been developed based on whole life cost modelling to consider the trade-off between different intervention strategies and to identify the most appropriate technology to apply. It proposes a move from conventional re-signalling to a more targeted approach of component renewal to maximise the asset life. This approach has been integrated with programmes of major interventions relating to the European Train Control System (ETCS) and implementation of NOS. The policy proposes to migrate control of signalling to centralised operational control centres at renewal. It proposes that signalling is converted to ETCS operation when renewal is required and there is sufficient rolling stock equipped for ETCS operation.

8.43 Signalling maintenance regimes are to be based on the criticality of the asset and tailored to asset type, configuration and location. The policy makes greater use of

reliability centred maintenance and remote condition monitoring to achieve this. For high criticality routes the policy involves a move towards more predictive maintenance, informed by remote condition monitoring; for low criticality routes it means a move towards more reactive maintenance. The policy also proposes the use of extended maintenance to manage assets until their renewal through major programmes of intervention such as those driven by ERTMS and NOS.

8.44 Application of the policy is forecast to result in a peak of signalling renewals expenditure in CP5 and a peak in remaining life in CP7, largely driven by a peak in ETCS re-signalling.

Level crossing asset policy

8.45 Network Rail has produced a level crossing asset policy for the first time. This reflects a need to increase the focus on level crossings as a system rather than as a collection of separate components.

8.46 The policy proposes to reduce the safety risk that level crossings contribute to the rail network, to maintain or improve condition and capability, and to move to a targeted renewal of subsystem parts. The policy sets out Network Rail's planned reduction of level crossing safety risk and its plans to facilitate closure, using the funds specified in the HLOSs: £65 million for England & Wales and £10 million for Scotland.

8.47 Whilst the policy considers renewal and maintenance issues, the focus is on reducing risk. Network Rail has developed a model to assess the risk reduction that can be achieved by a range of potential interventions.

8.48 There is a particularly close association between level crossing systems and signalling. The policy recognises the relationship between level crossings and the introduction of ERTMS and NOS which are key components of the signalling policy.

8.49 A key output of the policy is the assessment of how the level crossing safety fund can be applied to achieve the best reduction in risk.

Structures asset policy

8.50 The CP5 structures asset policy covers assets including underbridges, overbridges, major structures, tunnels, retaining walls, culverts, coastal defences and minor assets.

8.51 The policy represents a substantial change to current policy. It applies a risk based approach to deliver defined levels of safety, availability and capability. For bridges, the policy proposes application of different maintenance and renewal interventions to

address the risk associated with the condition of key structural components called principal load bearing elements (PLBEs). The associated intervention strategy is captured in a suite of 'policy-on-a-page' documents which aim to articulate policy clearly and simply, and to achieve a consistent approach to structures asset management across the network. The policy-on-a-page documents cover the main bridge types, substructures, culverts, retaining walls, tunnels and footbridges.

8.52 Network Rail has continued to develop a whole life cost model for structures, an approach it started in CP3. The bridges model analyses intervention strategies for the main bridge types. Significant groups of structures such as tunnels, major structures, and coastal, estuarine and river defences are not captured in the modelling but are assessed using individual bottom-up intervention or management plans.

8.53 The policy requires maintenance of structures on a newly developed programme of planned preventative works. Application of reliability centred maintenance is being considered but is not yet fully integrated. The case for wider application will be considered in CP5.

8.54 Network Rail's plans, based on improved condition data and the new policy, include a large increase in renewal volumes to restore the assets to a robust and sustainable position. The company proposes that the new policy is implemented over two control periods to manage funding and deliverability, with interventions focused on high criticality assets during CP5. This approach results in a peak level of expenditure in CP5 and high expenditure in CP6. Network Rail states that its understanding of civil assets is continuing to improve and the predicted volumes of work may change as a consequence. Application of the policy is forecast to improve average asset condition scores for PLBEs on bridges, reducing risk over CP5 and CP6.

Earthworks asset policy

8.55 The CP5 earthworks asset policy covers the management of embankments and cuttings.

8.56 The policy differs from the previous policy because, instead of undertaking work based on condition alone, it applies a risk-based approach to decide what work needs to be done, where and when. Work to be carried out is prioritised according to a risk metric, which is assessed on asset type, condition and criticality. For example, cuttings are considered a higher risk asset type and, within this group, rock cuttings

pose the highest risk. Condition is banded against four headings: top poor, poor, marginal and serviceable.

8.57 Four main work types are defined for earthworks assets: examination to assess condition, maintenance (for example minor repairs) to maintain asset condition, refurbishment to improve asset condition, and renewal of poor, top poor and failed assets. Drainage work (renewal, refurbishment or maintenance of the drainage) is also a key priority for earthworks, as covered by the new drainage policy.

8.58 Network Rail has developed an earthworks whole life cost model. The model has been used to investigate a wide range of policy options and intervention strategies to support the CP5 policy.

8.59 The policy aims to maintain asset condition and risk levels throughout CP5 and in the long-term. To achieve this there will be increased levels of maintenance and refurbishment and a reduction in full renewal work compared to CP4.

Drainage asset policy

8.60 Network Rail has produced a drainage asset policy for the first time, recognising the importance of drainage for performance and asset management across other key asset types. The policy covers drainage relating to earthworks, track, tunnels, structures and buildings. The document concentrates on the track and earthworks drainage, as this forms the majority of the drainage asset and has higher associated expenditure.

8.61 Network Rail's knowledge and management of its drainage asset has historically been poor. To start to address this it has carried out the Integrated Drainage Project (IDP), to review asset knowledge, carry out a survey where records are incomplete and establish a national drainage database. The policy draws on the outputs of the IDP.

8.62 The policy considers two components to drainage asset condition: its structural integrity and its service condition. Structural integrity defects are addressed by repairing or replacing the asset. Service condition relates to the water carrying capacity of the asset and defects are addressed through works such as cleansing or vegetation clearance. In both cases pipework condition is measured on a 1 to 5 grading system. Condition data for drainage remains incomplete and will be assessed over a period of years.

8.63 The criticality of the drainage assets is based on the criticality of those other asset groups which it impacts and benefits, such as track and earthworks. The policy defines various intervention options (inspect, survey, maintain, refurbish, renew and new build) depending on criticality, which are intended to minimise costs over the lifetime of the asset. For higher criticality assets the policy requires a more proactive approach to inspection and maintenance. Application of the policy is forecast to result in significantly increased renewals costs in CP5 compared to CP4 in order to bring the condition of the drainage asset up to a sustainable level, but this should reduce expenditure on dependent assets such as track and earthworks.

Buildings asset policy

8.64 The buildings asset policy covers maintenance, repair and renewal works on managed stations, franchised stations, light maintenance depots, maintenance delivery unit buildings and lineside buildings.

8.65 The policy is in two parts, 'building fabric' and 'mechanical & electrical equipment'. It extends the strategy applied in CP4 to cover better the range of operational property assets. The policy categorises stations into six groups, A to F, based on revenue and the number of people using the station (as is the case with the current policy).

8.66 It utilises an improved asset information system to understand better the condition and degradation of assets, to understand the impact of interventions and to facilitate whole life costing.

8.67 The policy requires station and light maintenance depot condition, as measured by the Station Stewardship Measure (SSM) and the Light Maintenance Depot Stewardship Measure (LMDSM), to be maintained at the levels achieved at the end of CP4. For buildings Network Rail is proposing to use the yearly number of 2 and 24 hour reactive faults to measure robustness and Percentage Asset Remaining Life (PARL) to measure sustainability. It forecasts that reported reactive faults will remain static in CP5, but that PARL will improve by 1% in CP5 and 16% by CP11 to give 58% PARL at that point. Across the buildings asset categories the policy requires maintenance, repair and renewal works to be carried out to ensure that the properties remain fit for purpose.

8.68 Further franchising out of maintenance and renewal activities to TOCs may also result in further review and development of SSM during the control period.

Electrical power asset policy

8.69 The CP5 asset policy for electrical power covers the management of traction power supply systems (including power from overhead lines and from conductor rail), and non-traction power supplies (including power for signalling, point heaters and conductor rail heating).

8.70 The policy is a significant development of the policy being used in CP4. Network Rail has changed its approach, from age-based to condition based, to achieve a lower whole life cost to manage the assets. The CP5 policy also introduces asset and route criticality and improved safety principles. It is supported by the use of whole life cost modelling to identify the optimum intervention options for the key assets covered by this policy. Modelling has been carried out for: overhead line equipment; signalling power supply systems (PSPs and signalling power distribution cables); HV switchgear for the AC and DC electrification systems; conductor rail; and HV cables on the DC electrification systems.

8.71 There is an increased focus on safety in the asset policy, including actions to reduce the amount of working on or near live conductors. The policy considers management of capacity on the network through improved system planning for electrification infrastructure. It proposes investment in metering and management systems to help increase efficient use of energy.

8.72 Network Rail forecasts that its electrical power policy will deliver a slight increase in the number of traction power failures causing delays of ten minutes or greater. This is due to a significant increase in electrical power assets in CP5, driven by the major programmes of electrification across the network. If the asset base was to remain the same as at the end of CP4, Network Rail forecasts consistent levels of performance with the end of CP4. Network Rail has modelled remaining life until CP11. These long-term forecasts highlight a reduction in remaining life, but this is again driven by the introduction of new assets due to the programme of CP5 electrification.

Telecoms asset policy

8.73 Network Rail Telecom's (NRT) CP5 asset policy for telecoms proposes a move from conventional renewals to a more targeted approach of component renewal to maximise the asset life. Whole life cost modelling has been carried out to consider the trade-off between different intervention strategies. The policy is aligned with programmes of major interventions relating to implementation of NOS.

8.74 Telecoms maintenance regimes are to be based on the criticality of the asset and tailored to asset type, configuration and location by means of implementing Service Level Agreements (SLA) with clients (the routes). The success of the asset policy is predicated on developing these SLAs that are not yet in use and therefore not proven to be achievable. NRT states that it will not be in a position to know whether the SLAs are achievable until around the middle of CP5. The policy also relies on the greater use of remote condition monitoring and the development of Risk-based maintenance Of Telecoms Equipment (ROTE) to release maintenance staff to resource the planned in-house renewal activity.

8.75 The policy aims to continue to meet the CP4 exit performance KPIs throughout CP5 despite a significant increase in asset quantities due to the introduction of GSM-R/FTN.

Wheeled plant asset policy

8.76 The CP5 asset policy for wheeled plant is a development of CP4 policy and covers management of a diverse collection of rail and road vehicles.

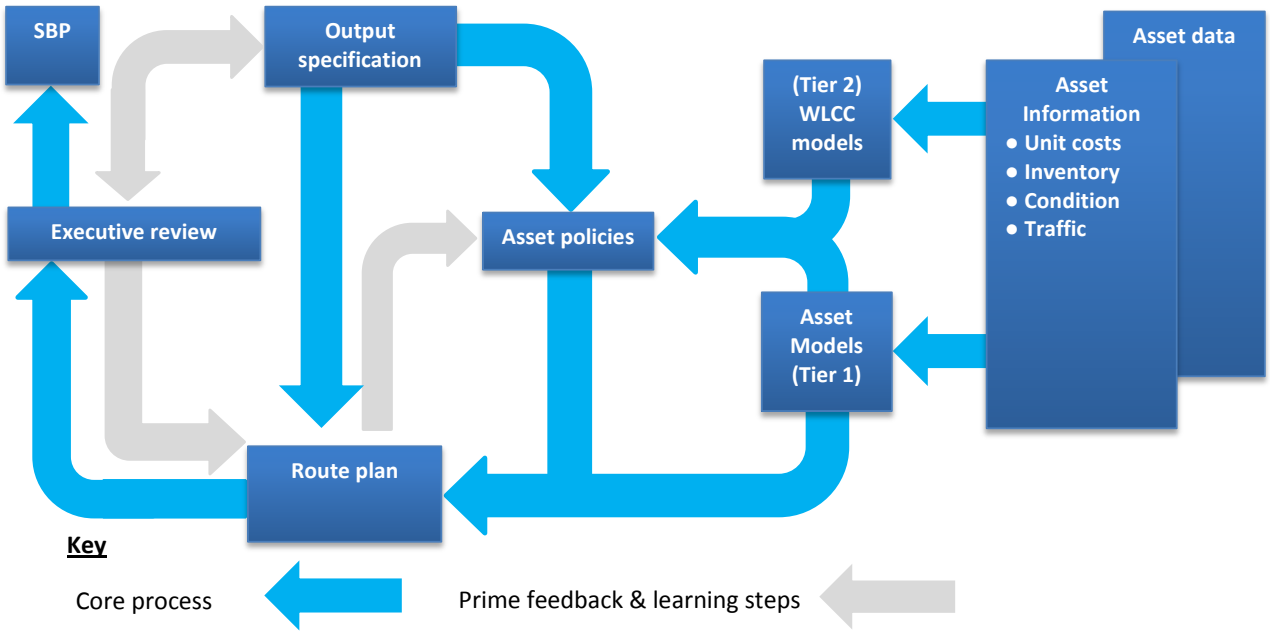
8.77 The policy is based on the requirements of the vehicle maintenance and overhaul instructions, assessment of fleet condition and known demands driven by routes and central requirements. It promotes a mix of new fleet procurement, life extension and maintaining the fleet to the existing condition. The policy drives efficiencies by extending the periods between maintenance and overhaul. The proposed intervention regime for fleet maintenance is based upon engineering information which Network Rail acknowledges is currently limited and inconsistent across some fleets.

8.78 The policy aims to deliver an overall condition, reliability and availability of fleet at the end of CP5 which is no worse than at the end of CP4, except where driven by customer demand.

Network Rail's development of its maintenance and renewals plans

8.79 Network Rail's SBP set out the process by which it developed its maintenance and renewal plans. This process is illustrated in Figure 8.4.

Figure 8.4: Network Rail's process for development of its maintenance and renewal plans



Development of maintenance plans

8.80 The key inputs to its maintenance plans are its current resource levels (labour, plant and materials), its projections of how these will need to change in CP5 (for example, to maintain new electrification assets) and its view of available efficiencies during the period. These have been used to develop its route plans for maintenance which feed directly into the SBP.

8.81 Network Rail is also developing new approaches to maintenance which are referenced in its asset policies and maintenance strategy. These have been modelled to develop a central view of future volumes and therefore costs of work.

8.82 We discuss our view of Network Rail's maintenance planning process in further detail later in the chapter.

Development of renewals plans

8.83 The key inputs to its renewals plans are its asset information (type, number, condition, location, criticality etc.), its asset degradation information and its cost information (for example unit costs).

8.84 The fundamental building block of the renewal plans is the company's suite of asset policies which set out the interventions that it will carry out in managing its assets. The policies are used in two parallel but linked processes: they are modelled to develop a

central view of future volumes and therefore costs of work; and they are used by Network Rail's ten operating routes to develop route-based workbanks, volumes and costs. The plans developed by the centre and those developed by the routes are used to challenge each other at all stages of their development. The final SBP submissions are developed from a combination of the two.

8.85 We discuss our view of Network Rail's renewals planning process in further detail later in the chapter.

Route plans

8.86 Network Rail has, for the first time, presented its maintenance and renewals plans in ten operating route plans. This reflects the recent organisational change which has devolved some asset management decision making to the routes.

8.87 For maintenance its expenditure plans are based on route estimates of the resource required to safely maintain the railway. The route-based figures include consideration of the impact of increased traffic and new infrastructure.

8.88 Network Rail's renewals expenditure plans are based on the outputs of a challenge process between modelled expenditure requirements and plans developed by the routes. The company's models produce route renewals expenditure forecasts which consider route specific asset information, unit costs disaggregated by structural factors and efficiencies applied by local asset mix. The routes produced their plans based on their local knowledge of the asset base, knowledge of delivery constraints, understanding of local costs and local efficiency initiatives. The challenge process between modelled expenditure and route-based plans has helped to improve the robustness of the route plans.

8.89 Key route specific issues are discussed in the Maintenance and Renewals sections below.

Network Rail's maintenance plans

Volumes

8.90 As discussed previously the company has built up the maintenance plans in its SBP by forecasting its resourcing requirements. In general it has not used volumes of required work as the basis for developing its maintenance expenditure plans.

8.91 Following submission of the SBP we have required Network Rail to submit its planned volumes of maintenance work to be delivered by its maintenance expenditure plans. Certain volumes have been submitted for track, electrification and power, and signalling maintenance activities, a subset of which are shown in Table 8.1. We will work with Network Rail to develop appropriate maintenance volume measures for use as indicators in CP5.

Table 8.1: Network Rail's planned maintenance volumes, Great Britain

Description	Unit	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
Tamping	km	6933	6873	6749	6688	6781	34023
Stoneblowing	km	3738	3712	3668	3649	3687	18454
Manual Wet Bed Removal	Bay	20608	20457	19784	18916	18316	98081
S&C Tamping	Point End	4480	4395	4372	4320	4331	21899
Mechanical Spot Re-sleepering	Sleeper	5486	5415	5368	5425	5391	27084
Replacement of S&C Bearers	Each	8512	8340	8021	7416	8055	40344
S&C Arc Weld Repair	Number	10673	10696	10711	10714	10783	53578
Mechanical Wet Bed Removal	Bay	12189	12152	12023	11249	10962	58575
Level 1 Patrolling Track Inspection	Mile	206577	201836	197972	197901	199631	1003918
Mechanised Patrolling Track Inspection	Mile	8372	7462	7162	7162	7241	37399
Replacement of Pads & Insulators	Sleeper	553385	544931	538586	515209	529333	2681444
Jointed Track Hot Weather Preparation	Joint	552404	547527	538101	532860	531832	2702724
Manual Correction of PL Track Geometry (CWR)	Track Yard	1152599	1164832	1121455	1070372	1070232	5579489

Description	Unit	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
Manual Rail Grinding	Rail Yards	418045	417777	417517	417365	417659	2088363
Rail Changing	Rail Yard	201615	197715	193905	190932	191793	975960
Fences and Boundary Walls	Yard	1010959	1045381	1036425	1049740	1082847	5225352
S&C Inspection (Other)	Point End	205544	206526	208930	211437	215341	1047778
S&C Maintenance (Other)	Point End	422003	420720	421167	420365	422869	2107125
S&C Renew Half Set of Switches	H/S Switch	874	864	851	835	865	4289
S&C Stoneblowing	Point End	858	949	1073	1043	1037	4961
Track Inspection (Other)	Miles	312536	313560	314742	315743	316517	1573097
Train Grinding - S&C	Point End	3985	3997	4003	4015	4145	20144
Signalling Cables	Various	124454	124483	124485	124418	124412	622251
Equipment Housing locations	Each	296870	296757	296431	296319	296206	1482583
Point End Routine Maintenance Powered	Point End	477654	477761	477862	478064	478076	2389416
Signals Routine Maintenance colour lights	Each	192955	193027	192488	192624	192427	963520
Train Detection - Axle Counters	Each	15096	15750	16380	17024	17115	81366
Train Detection - TC's AC	Each	100431	99916	99894	99860	99852	499951
Train Detection - TC's DC	Each	137104	136054	134481	133254	133079	673972
Level Crossings	Each	84001	84001	83927	83868	83815	419612

Description	Unit	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
Maintain Conductor Rail	Various	47641	47641	47489	47263	47114	237147
Maintain OHL Components	Various	194666	199649	204566	204536	222871	1026287
Maintain Points Heating	Each	140549	140550	140551	140552	140552	702753
Maintain Signalling Power Supplies	Number	42964	42964	42964	42964	42964	214821

Efficiency

8.92 When directly comparing expenditure forecast for the final year of CP5 with proposed expenditure in the final year of CP4, maintenance costs appear to increase. However, this excludes the effect of the CEFA and reactive maintenance accounting change between the two control periods, ignores the effects of traffic and network growth, and does not adjust for projects which are not representative of on-going expenditure requirements. When expenditure forecast for the final year of CP4 is adjusted for these effects the network total efficiency proposed is 13.7%, for Scotland it is 9.9%, and for England & Wales it is 14.1%.

8.93 The forecast maintenance efficiencies are planned to come from a wide range of initiatives including:

(a) a risk based approach to maintenance ensuring that maintenance regimes are tailored to the configuration, condition and location of individual assets;

(b) improved information management allowing better targeting of work, improved response to infrastructure faults and reduced reliance on paperwork processes;

(c) further implementation of remote condition monitoring;

(d) improved working practices and multi-skilling;

(e) increased standardisation of maintenance tasks;

(f) further mechanisation, including the full rollout of plain line pattern recognition and new vegetation clearance plant;

(g) improvements to the maintenance support and administration organisation;

(h) further recycling of materials; and

(i) optimisation of contracting strategy where appropriate.

8.94 Network Rail has included some 'stretch' (approximately £140m) in its maintenance efficiency targets, over and above the efficiencies which it has allocated to specific initiatives.

Expenditure

8.95 Network Rail's SBP sets out proposed maintenance expenditure in CP5 of £5.2bn, of which £4.7bn relates to England & Wales and £0.52bn relates to Scotland. This compares to maintenance expenditure of £5.4bn in CP4, of which £4.9bn is in England & Wales and £0.48bn is in Scotland. The following tables set out its high level maintenance expenditure plans.

Table 8.2: Network Rail's plans, maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	1145	1166	1170	1166	1166	-	5813
Efficiency	-	5.4%	2.6%	2.4%	1.9%	2.2%	-	13.7%
Post-efficient expenditure	982	1083	1074	1052	1029	1006	5406	5243

Table 8.3: Network Rail's plans, maintenance, England & Wales

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	1036	1048	1053	1051	1056	-	5243
Efficiency	-	5.7%	2.1%	2.5%	2.0%	2.7%	-	14.1%
Post-efficient expenditure	893	977	968	948	927	906	4928	4726

Table 8.4: Network Rail's plans, maintenance, Scotland

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	109	118	117	115	110	-	570
Efficiency	-	3.3%	6.7%	1.4%	0.8%	-2.2%	-	9.9%
Post-efficient expenditure	89	105	106	104	102	100	478	517

Maintenance by asset

8.96 Network Rail has set out its maintenance plans by asset as described below.

Track

8.97 Network Rail's plans for track maintenance costs incurred by the routes (i.e. excluding the maintenance costs incurred by NDS) are set out in Table 8.5.

Table 8.5: Network Rail's plans, track maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	434	439	439	438	435	2185
Efficiency	-	4.7%	3.5%	2.4%	2.3%	2.6%	14.5%
Post-efficient expenditure	420	414	404	395	384	372	1969

8.98 The plans show increased pre-efficient levels of track maintenance expenditure compared to the final year of CP4 due to the effects of increased traffic and enhancement works. The company's modelling of the off-track and drainage policies suggest that increased expenditure is required to address a substantial backlog of work and to improve asset condition to a sustainable level.

8.99 Maintenance volumes show an increase in pro-active maintenance activities to improve and maintain track quality, particularly the increased use of mechanised stoneblowing. Work items such as ballast replacement and wet-bed removal are

forecast to reduce as a result of better drainage management and more targeted refurbishment items.

8.100 For track maintenance Network Rail is proposing efficiencies of 14.5% by the final year of CP5. These efficiencies are projected to come from better asset management (including improved whole life cost analysis, more proactive risk based maintenance, improved ability to automate inspection and maintenance works and improved data quality) and from improved unit costs (through better programming of work, more specialised teams but with greater multi-skilling and better management of possessions).

Signalling

8.101 Network Rail's plans for signalling maintenance are set out in Table 8.6.

Table 8.6: Network Rail's plans, signalling maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	158	158	158	159	160	793
Efficiency	-	4.6%	1.9%	1.6%	2.3%	2.0%	11.8%
Post-efficient expenditure	158	151	148	146	143	141	729

8.102 The volume of signalling maintenance is projected to increase in some routes due to enhancement works, for example Thameslink and Crossrail. Some reduction in maintenance activity is driven by the simplified maintenance regimes associated with new asset types, but this is countered by increased maintenance work driven by installation of new obstacle detection assets at level crossings.

8.103 Network Rail's plans for signalling maintenance include proposed efficiencies of 11.8% nationally by the final year of CP5. These efficiencies are projected to come from a range of initiatives, many of which are common for maintenance of different asset types. They include improved asset information management, a more targeted risk-based approach, better programming of work, greater multi-skilling, better management of possessions, improved rapid response and adoption of remote condition monitoring (for example on level crossings).

Civils and buildings

8.104 Network Rail's plans for civils maintenance are set out in Table 8.7.

Table 8.7: Network Rail's plans, civils and buildings maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	82	82	82	81	82	408
Efficiency	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Post-efficient expenditure	35	82	82	82	81	82	408

8.105 Activities associated with maintaining structures, earthworks and buildings are largely reported within the renewals budgets. The only activities reported as 'maintenance' are examinations and assessments subcontracted out through the national Civil Engineering Framework Agreement (CEFA). The CEFA contract covers inspection of assets such as bridges, tunnels, stations, lineside buildings, earthwork cuttings and slopes.

8.106 In its SBP submission, Network Rail treated all CEFA costs in CP5 as maintenance. In the final year of CP4 £35m of CEFA costs are treated as maintenance and £49m are treated as renewals. Total CEFA costs remain steady over CP4 and CP5 at slightly over £80m.

8.107 Network Rail has not forecast efficiencies associated with the CEFA contract during CP5.

Electrical power and fixed plant

8.108 Network Rail's plans for electrical power and fixed plant maintenance are set out in Table 8.8.

Table 8.8: Network Rail's plans, electrical power and fixed plant maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	94	101	104	105	108	512
Efficiency	-	9.6%	3.7%	3.5%	1.2%	2.2%	18.9%
Post-efficient expenditure	73	85	88	87	87	88	435

8.109 Network Rail forecasts that its pre-efficient expenditure on maintenance of electrification and plant assets will increase substantially during CP5. This is due to new electrification assets being delivered through widespread enhancement works. The Western route is forecast to see a trebling of expenditure due to Great Western electrification, and Wales and East Midlands routes will also require increased maintenance activity due to enhancement works. Increased activity is also driven by additional cable testing work to comply with legislative requirements.

8.110 Network Rail's maintenance plans for electrical power and fixed plant are largely based on historical headcount with overlays applied for maintenance of new assets and increased efficiencies. Efficiencies are projected to be generated by activity reductions from initiatives such as improved planning and targeting of work, adoption of improved remote condition monitoring and application of risk based maintenance. Unit cost efficiency initiatives include developing a multi-skilled workforce, improving resourcing strategy and improving possession strategy. Network Rail projects electrification and fixed plant maintenance efficiencies of 18.9% nationally by the final year of CP5.

Telecommunications

8.111 Network Rail's plans for telecoms maintenance incurred by the routes (i.e. excluding the maintenance costs incurred by NRT) are set out in Table 8.9.

Table 8.9: Network Rail's plans, telecoms maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	22	22	21	21	21	107
Efficiency	-	3.9%	3.7%	2.6%	3.3%	5.0%	17.1%
Post-efficient expenditure	21	21	20	19	19	18	97

8.112 Telecoms maintenance activity will increase at the start of CP5 due to the increased asset base driven by the FTN / GSM-R project. During the period maintenance requirements will be reduced as obsolete assets are removed. Telecoms maintenance efficiencies are forecast to come from increased productivity with more renewals work being delivered and charged out.

Other Network Operations maintenance

8.113 Network Rail's plans include significant expenditure against other maintenance costs items, such as indirect staff within the routes and at headquarters, route asset management teams, asset management services and national delivery service.

8.114 Asset management services costs in maintenance include the costs associated with the asset information directorate, asset management technical services and asset management telecoms. Across support and maintenance activities, asset management services are forecast to deliver 20% efficiencies.

8.115 National Delivery Service (NDS) forms part of Network Rail's corporate services function and is its national logistics and procurement service provider. Its maintenance activities include operation and servicing of strategic plant (e.g. rail grinding and infrastructure monitoring plant), support logistics (e.g. train network runs and shunting) and associated staff costs. NDS activities are forecast to deliver 15% efficiencies during the period (over both support and maintenance activities).

Maintenance – route specific issues

8.116 All routes have assessed their maintenance expenditure requirements for CP5 through resource based plans. The routes have generally accepted central proposals for efficiency opportunities and, in some cases, set out their own initiatives. Network Rail's post-efficient plans are set out by route in Table 8.10.

Table 8.10: Network Rail's post-efficient maintenance plans, by route

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Anglia	99	104	103	102	99	94	503
East Midlands	50	58	58	56	54	54	280
Kent	67	75	73	71	70	68	355
LNE	154	160	162	158	159	161	800
LNW	252	271	267	262	255	247	1302
Scotland	89	105	106	104	102	100	517
Sussex	52	57	57	53	52	50	269
Wales	52	61	59	59	58	57	294
Wessex	78	83	82	81	77	73	395
Western	87	109	108	106	103	103	528

Note: CP5 expenditure includes additional costs associated with reactive maintenance.

8.117 We highlight some of the key route specific factors included within the SBP below.

Anglia

8.118 The Anglia route plan includes incremental maintenance expenditure required for Crossrail and the introduction of an additional OLE team on the North London Line.

8.119 Some local efficiencies have been identified, including those resulting from delivery of capital expenditure, improved S&T response, rationalisation of depots and reorganisation of works delivery.

East Midlands

8.120 The route plan includes significant maintenance efficiencies but these will be offset by the increased maintenance requirements introduced by the Thameslink programme and electrification of the Midland Main Line.

8.121 Forecast efficiencies are in line with central submissions and include gains through remote condition monitoring and plain line pattern recognition.

Kent

8.122 The Kent route plan includes extra resource for measuring the condition of signalling power supply cables. Its electrical power asset base will increase due to enhancements including Thameslink, Crossrail and other HLOS associated power supply upgrades.

8.123 Kent's maintenance costs are influenced by a high number of structures which require additional maintenance resource (bridges which support the rails on longitudinal timbers) and by a high density of S&C with difficult access. It is also proposing changes to practice through, for example, mechanised vegetation management, more remote condition monitoring, use of plain line pattern recognition and mobile maintenance units.

LNE

8.124 The LNE route maintenance plan considers the requirement for increased resource to service the new electrification assets between Leeds, Selby and at Colton Junction. It also includes the introduction of mobile maintenance units to make best use of track access opportunities, and two dedicated drainage teams to mitigate the risk of bank slips in extreme weather. The impact of NOS is considered to be cost neutral. The route sees real efficiency gains to be made through better front-line planning and assumes further efficiencies will be delivered through the centrally identified initiatives.

LNW

8.125 LNW's plan is generally in line with policies and centrally identified efficiencies but some further efficiencies have been identified by the route. It proposes routine helicopter patrols of OLE, enhancing the train-borne collection of conducting systems information and efficiencies in the management of track geometry.

8.126 The scope of the route's maintenance activity is increased due to enhancement works including electrification in the North West and at the South end of LNW. The plan includes a significant increase in resource for testing of cables and for introduction of dedicated lookout operated warning system teams.

Scotland

8.127 The Scotland route plan commits to delivering the volumes of maintenance work determined by the asset management organisation to reflect asset policy. It has made

some changes to route criticality classifications to reflect their importance to the Scottish network.

8.128 The route plan includes a significant increase in volumes of track work such as tamping, rail replacement and fencing to address areas of non-compliance and remove temporary non-compliances. The higher volumes partly reflect an increased asset base due to enhancements and the Borders rail link.

8.129 The route has carried out an aerial survey of vegetation to target its vegetation management programme to return the asset to a sustainable position. Its drainage plans are also based on improved asset knowledge from the national drainage survey and include routine drainage surveys within the maintenance remit.

8.130 Further electrification resource has been planned to deliver increased work driven by improved asset knowledge, signalling power cable testing requirements and enhancement schemes such as EGIP and the new Borders Railway.

8.131 The plan includes consideration of the impact of central efficiency initiatives which particularly drive efficiency for track and electrification. Although centrally derived efficiencies are thought to deliver benefits for signalling and telecoms delivery, the plan assumes that they will not generate savings to headcount as resource requirements are driven by need to provide emergency response. The route has developed a local initiative to move to two person signalling and telecoms teams to deliver efficiency.

Sussex

8.132 The route has, in the main, accepted centrally identified maintenance efficiencies and identified some additional local efficiencies. Its plans include the consolidation of delivery units into one route-wide delivery unit and the rationalisation of depots. Track efficiencies are envisaged from higher productivity of new on-track machines and better rail management (tamping and rail-head grinding). Signalling efficiencies are lower than national efficiencies due to the plan not to fit lightweight structures until half-way through CP5.

8.133 In some areas it identifies drivers of increased work load, for example where there is an increase in the asset base, as is the case with the GSM-R network.

Wales

8.134 The Wales route maintenance plan aims to deliver central policy and to implement centrally identified maintenance efficiencies. It identifies that enhancement schemes will impact the route's maintenance requirements for electrification.

Wessex

8.135 The route considers its maintenance plan to be in line with asset policy but identifies a need to improve track maintenance in CP5 as it recognises that it may not meet the CP4 exit targets. Additional volumes of track maintenance are forecast in response to tonnage increases following enhancements in CP4. Vegetation management is identified as a particular problem for the route, with a proposed programme of lineside de-vegetation and weed killer treatment.

Western

8.136 Western's plans for maintenance in CP5 are driven by major investments over the period, including Crossrail, Reading remodelling and electrification. Maintenance activities will be impacted by increased traffic and resulting degradation rates, an increased asset base and a reduction in access. The route will significantly increase its electrical power resource to maintain the increased asset base. In other asset disciplines maintenance and renewal works carried out in possessions will be impacted by the increased need for electrical isolations towards the end of the period.

8.137 Efficiencies in the Western plan are aligned with the nationally identified strategies and include the move towards risk based maintenance regimes, increased mechanisation and a multi-skilled workforce. The route sees key opportunities in maintaining assets as systems (particularly S&C), taking a holistic approach to the risks being controlled.

Network Rail's renewals plans

8.138 This section covers Network Rail's plans for renewals in CP5. Its proposed volumes of asset renewal during the period are set out in Tables 8.11 to 8.13. These tables set out some of the key volumes planned by Network Rail; they do not capture all volumes proposed. We will work with Network Rail to develop appropriate renewal volume indicators for CP5. The company's planned renewals expenditure and efficiencies are set out in Tables 8.14 to 8.16.

Volumes

8.139 Network Rail has forecast track renewals volumes for CP5 based on the new ways of working defined by its track policy. This has made comparison of volumes to CP4 difficult. Volumes have therefore been converted to kilometres of rail, sleeper and ballast renewal, and number of S&C units. On this basis, the company plans to deliver fewer kilometres of rail and sleepers, more kilometres of ballast and significantly more S&C units. These changes are mainly driven by the new policy, but also include accelerated renewals.

8.140 Signalling volumes, as measured in Signalling Equivalent Units (SEUs), are forecast to be much higher in CP5 than in CP4. Total SEU renewals almost double, from approximately 5,800 in CP4 to approximately 11,000 in CP5. The increase is largely driven by renewals associated with delivery of NOS. The SEU volume for CP5 shows a marked increase in ERTMS delivered units, in line with the ERTMS national strategy. The number of level crossings renewals to be delivered also increases from 123 in CP4 to 499 in CP5, again largely driven by NOS and requirements for obstacle detection.

8.141 Network Rail forecasts that its new civils asset policy requires a step-change in civil asset renewals volumes, with increases relative to CP4 in almost all work types. Volumes of underbridge works are forecast to increase by 101%, volumes of overbridge works by 7%, volumes of tunnels works by 58% and volumes of coastal and estuarial defences by 141%.

8.142 Volumes of renewals relating to buildings assets have not been captured during CP4 but have been forecast for CP5 for franchised and managed station assets.

8.143 Plans for electrification and fixed plant show increased volumes of conductor rail and low voltage DC (LVDC) distribution cables compared to CP4. AC distribution volumes are significantly lower than in CP4 as are all DC distribution volumes with the exception of LVDC distribution cables. A high volume of signalling power cable renewals is planned to address a recently identified backlog of work. The plans include new volume measures for CP5, including volumes of overhead line mid-life refurbishments and of signalling power cable renewals.

Table 8.11: Network Rail's planned renewal volumes (subset of main categories), Great Britain

Volumes	Units	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
Track							
Rail	km	744	690	841	850	815	3939
Sleepers	km	459	434	551	564	547	2555
Ballast	km	578	642	661	603	663	3146
S&C	no.	599	580	671	597	610	3056
Signalling							
Conventional resignalling	SEU	1742	2769	2559	1715	1048	9832
ERTMS resignalling	SEU	0	80	115	146	868	1209
Level crossings	no.	58	95	137	124	85	499
Civils							
Overbridges	sq ms	10012	10012	10012	10012	10012	50062
Underbridges	sq ms	156530	153468	154031	153463	156846	774337
Tunnels	sq ms	24627	24627	24627	24627	24627	123136
Buildings (franchised stations)							
Building - Roof Structure	sq ms	20493	4934	2660	2879	2549	33515
Platform - Surface	sq ms	69868	62404	85518	56410	29137	303337
Canopy - Roof Structure	sq ms	21195	18093	20729	18305	16058	94380
Train Shed - Roof Structure	sq ms	30314	10613	22480	2765	450	66622
Footbridge - Surface	sq ms	5855	3337	5049	4578	2663	21482
Electrical power and fixed plant							
Overhead line mid-life refurbishment, wire runs	no.	59	70	70	65	52	316
Overhead line structure renewal	no.	116	158	186	63	99	621

Volumes	Units	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
DC distribution HV switchgear renewals	no.	17	36	3	9	3	68
DC distribution HV cable	km	47	25	28	21	21	142
LV DC switchgear renewal	no.	82	78	70	69	34	332
Conductor rail renewal	km	40	32	40	23	15	149
Signalling power distribution	km	469	755	649	619	318	2810
Telecoms							
SISS CIS	no.	2662	2265	2242	2113	1714	10996
SISS PA	no.	1007	1466	1377	394	351	4596
SISS CCTV	no.	91	263	228	228	109	919

Table 8.12: Network Rail's planned renewal volumes (subset of main categories), England & Wales

Volumes	Units	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
Track							
Rail	km	642	588	712	721	686	3349
Sleepers	km	390	364	454	467	450	2126
Ballast	km	523	587	583	524	585	2801
S&C	no.	548	529	620	546	559	2803
Signalling							
Conventional resignalling	SEU	1725	2514	1867	1594	966	8666
ERTMS resignalling	SEU	0	80	115	146	868	1209
Level crossings	no.	53	95	126	123	81	478
Civils							
Overbridges	sq ms	8941	8941	8941	8941	8941	44706
Underbridges	sq ms	133845	132073	132391	130723	133470	662504
Tunnels	sq ms	20400	20400	20400	20400	20400	102000
Buildings (franchised stations)							
Building - Roof Structure	sq ms	20173	4669	2638	2879	2549	32908
Platform - Surface	sq ms	69868	62404	85408	56410	29137	303227
Canopy - Roof Structure	sq ms	21195	18093	20729	18281	16057.9	94356
Train Shed - Roof Structure	sq ms	30314	10613	22400	2395	0	65722
Footbridge - Surface	sq ms	5855	3337	5049	4578	2663	21482
Electrical power and fixed plant							
Overhead line mid-life refurbishment, wire runs	no.	56	67	67	62	49	301

Volumes	Units	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
Overhead line structure renewal	no.	113	155	183	60	96	606
DC distribution HV switchgear renewals	no.	17	36	3	9	3	68
DC distribution HV cable	km	47	25	28	21	21	142
LV DC switchgear renewal	no.	82	78	70	69	34	332
Conductor rail renewal	km	40	32	40	23	15	149
Signalling power distribution	km	397	681	575	512	245	2410
Telecoms							
SISS CIS	no.	2662	1471	2242	2113	1714	10202
SISS PA	no.	1007	1466	1377	394	351	4596
SISS CCTV	no.	88	211	228	226	106	860

Table 8.13: Network Rail's planned renewal volumes (subset of main categories), Scotland

Volumes	Units	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
Track							
Rail	km	101	101	129	129	129	590
Sleepers	km	69	69	97	97	97	429
Ballast	km	55	55	78	78	78	345
S&C	no.	51	51	51	51	51	253
Signalling							
Conventional resignalling	SEU	17	255	692	121	82	1167
ERTMS resignalling	SEU	0	0	0	0	0	0
Level crossings	no.	5	0	11	1	4	21
Civils							
Overbridges	sq ms	1071	1071	1071	1071	1071	5356
Underbridges	sq ms	22685	21395	21639	22740	23375	111834
Tunnels	sq ms	4227	4227	4227	4227	4227	21137
Buildings (franchised stations)							
Building - Roof Structure	sq ms	320	265	22	0	0	607
Platform - Surface	sq ms	0	0	110	0	0	110
Canopy - Roof Structure	sq ms	0	0	0	24	0	24
Train Shed - Roof Structure	sq ms	0	0	80	370	450	900
Footbridge - Surface	sq ms	0	0	0	0	0	0
Electrical power and fixed plant							
Overhead line mid-life refurbishment, wire runs	no.	3	3	3	3	3	15
Overhead line structure renewal	no.	3	3	3	3	3	15

Volumes	Units	CP5					CP5
		2014-15	2015-16	2016-17	2017-18	2018-19	Total
DC distribution HV switchgear renewals	no.	0	0	0	0	0	0
DC distribution HV cable	km	0	0	0	0	0	0
LV DC switchgear renewal	no.	0	0	0	0	0	0
Conductor rail renewal	km	0	0	0	0	0	0
Signalling power distribution	km	72	73	74	107	73	400
Telecoms							
SISS CIS	no.	0	794	0	0	0	794
SISS PA	no.	0	0	0	0	0	0
SISS CCTV	no.	3	52	0	2	3	59

Efficiency

8.144 Network Rail has proposed CP5 exit renewals efficiencies of 15.7% for the network, 15.5% for Scotland and 15.7% for England & Wales[132].

8.145 The company has set out plans for its renewals efficiencies in a series of business cases. Key areas for delivering efficiencies are:

(a) development of policies which Network Rail considers to be better optimised for minimum whole life cost;

(b) asset information efficiencies to be delivered by ORBIS;

(c) better scheduling of work;

(d) more effective contractual relationships;

(e) standardisation of processes; and

(f) multi-skilling of staff.

[132] In Network Rail's SBP it presented renewals efficiency for 'core' asset renewals only, which it defined as track, signalling, civils, buildings, telecoms, and electrification and plant. It presented figures excluding the efficiencies which are built into its CP5 asset policies. Figures presented here are for all renewals expenditure and include the efficiencies which are built into its CP5 policies.

8.146 Efficiencies are discussed by main asset category later in the chapter.

Expenditure

8.147 Network Rail forecasts renewals expenditure of £13.8bn across the network, £1.49bn in Scotland and £12.3bn in England & Wales. This level of expenditure is considerably higher than in CP4 despite efficiencies achieved in CP4 and forecast to the end of CP5, and despite an accounting change moving costs from renewals to maintenance. Network Rail's key proposals which drive this increase in expenditure are:

(a) the rationalisation and centralisation of signalling control through implementation of NOS;

(b) a large increase in proposed expenditure on civil structures and earthworks renewals resulting from the application of the updated policy and a better understanding of asset condition, degradation and risk, the net effect of which is forecast to deliver a step-change improvement in the level of civil assets risk on the network;

(c) renewals brought forward from future control periods to deliver work more effectively, for example as the result of enhancement schemes, or to make use of access before it is limited by traffic growth;

(d) proposed expenditure on improving asset information systems and management, ORBIS; and

(e) a proposal for additional investment schemes where Network Rail believes there is a business case. For example it has proposed additional investment in improved information technology, Research & Development (R&D), safer and faster isolations and a new system to provide alerts to track workers.

Table 8.14: Network Rail's plans, renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	3017	3202	3243	3163	3129	-	15754
Efficiency	-	8.2%	2.7%	2.8%	1.6%	1.4%	-	15.7%
Post-efficient expenditure	2784	2770	2861	2818	2704	2638	12833	13791

Table 8.15: Network Rail's plans, renewals, England & Wales

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	2697	2810	2885	2835	2809	-	14036
Efficiency	-	8.0%	2.8%	2.6%	1.7%	1.5%	-	15.7%
Post-efficient expenditure	2541	2481	2511	2512	2426	2367	11476	12297

Table 8.16: Network Rail's plans, renewals, Scotland

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	320	392	358	328	320	-	1718
Efficiency	-	9.7%	1.3%	4.0%	0.9%	0.3%	-	15.5%
Post-efficient expenditure	243	289	350	306	278	271	1356	1493

Outputs

8.148 Network Rail has forecast the asset condition and performance metrics which its policies will deliver as described in chapter 3. It is developing its forecasts of asset condition for the whole asset base, presented in five condition bands. For both condition and performance its approach is, in the main, to keep asset specific metrics constant at the level forecast for the end of CP4. However, for civil structures, earthworks and off-track it is planning an improvement in overall condition. For track, number of failures per year causing delays of greater than 10 minutes is forecast to increase marginally. For electrification and plant the same metric is forecast to increase by approximately 10%. For structures, the number of open risk items with a risk score of greater than 20 is expected to reduce significantly by the end of CP5.

Renewals national by asset

Track

8.149 Network Rail's plans for track renewals are shown in Table 8.17.

Table 8.17: Network Rail's plans, track renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	780	769	833	794	779	-	3954
Efficiency	-	7.6%	3.6%	2.3%	3.2%	3.5%	-	18.8%
Post-efficient expenditure	816	720	684	725	669	633	3762	3431

8.150 Network Rail's proposed track policy is intended to maintain track performance throughout CP5 at the level targeted for the end of CP4. It proposes an increased focus on refurbishment and maintenance options as alternatives to full renewal, and increased focus on S&C to target work at more critical assets and reduce risk. This approach leads to a reduced volume of rail and sleeper renewal but an increased volume of ballast and S&C renewal.

8.151 Track renewal expenditure (excluding off-track assets) is forecast to be £3.08bn (£3.55bn before efficiencies) in CP5, compared with £3.52bn expenditure expected in CP4.

8.152 The off-track policy moves from a reactive approach to failed assets to a proactive one using clear risk-based intervention criteria and this is forecast to result in expenditure of £0.35bn (£0.41bn before efficiencies) in CP5, much greater than the £0.24bn planned in CP4.

8.153 The track renewals expenditure plans include £325m of accelerated renewals. £169m of this relates to renewals brought forward on the Western route in anticipation of engineering access constraints following electrification and completion of Crossrail. £64m of the accelerated renewals are in LNE where carrying out track renewals prior to electrification enhancements will reduce unit costs. Anglia is planning £30m of accelerated track renewals to benefit from synergies with the Crossrail programme. Wessex, Sussex, Kent and East Midlands routes have included accelerated renewals driven by increased tonnage as a result of enhancements.

8.154 Network Rail is planning track renewals efficiency of 18.8% by the end of CP5. This is projected to come from improved supply chain management, revision of standards and rules, reduction in site overheads, and a transition to design and build contracts.

Contractor resource utilisation will be improved through better workbank visibility and better profiling of work through weeknights to facilitate a full-time, more highly skilled workforce.

8.155 Off-track renewals efficiencies of 19.2% are planned for CP5.

Signalling

8.156 Network Rail's plans for signalling renewals are shown in Table 8.18.

Table 8.18: Network Rail's plans, signalling renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	835	935	888	769	707	-	4133
Efficiency	-	8.4%	4.1%	4.9%	4.1%	3.6%	-	22.7%
Post-efficient expenditure	533	765	821	742	616	546	2421	3490

8.157 Its signalling renewals plans are influenced by three main drivers: condition driven renewals, the implementation of NOS and the industry move to ETCS. It has built its plans by overlaying programmes of work on to the base level of renewals work required by adoption of CP5 policy.

8.158 NOS drives a large increase in signalling renewals spend in CP5 but its benefits are realised in operating expenditure. The move to ETCS should generate other benefits in the long-term including reducing the lineside assets and related work, improving capacity and improving safety.

8.159 Proposed signalling renewal expenditure for CP5 is £3.49bn (£4.13bn before efficiencies), compared to £2.42bn planned in CP4.

8.160 Signalling renewals efficiencies of 22.7% are forecast to be delivered by the final year of CP5. Some of these are forecast to be delivered through scope efficiencies from its CP5 policies and enabled by the ORBIS asset information programme. The remainder are built into its framework contracts and include efficiencies from collaborative / partnership working, efficiency initiatives identified by Network Rail and efficiencies agreed to be delivered by the contractor.

Civils

8.161 Network Rail's plans for civils renewals are shown in Table 8.19.

Table 8.19: Network Rail's plans, civils renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	592	576	575	572	590	-	2904
Efficiency	-	4.6%	2.1%	2.2%	3.0%	2.7%	-	13.8%
Post-efficient expenditure	397	565	539	525	506	509	1944	2644

8.162 Network Rail has forecast civils expenditure of £2.64bn (£2.90bn before efficiencies) in CP5. This compares to planned expenditure of £1.94bn in CP4. The increase in proposed expenditure is driven by projected costs from implementation of CP5 policy and improved understanding of the civils asset base. The new policy is intended to deliver a lower level of risk on the network.

8.163 Network Rail's plans include civils renewals efficiency of 13.8% by the final year of CP5. Its identified efficiency initiatives are largely common to structures and earthworks. A key enabler of efficiency is planned to be improved asset information which is expected to be more readily available, to enhance decision making and to be delivered through improved asset monitoring regimes. Better business planning and better collaboration between asset teams will improve work packaging to maximise possession productivity. Innovative ways of delivering high volumes of work and unit cost reductions from improved supply chain management also contribute to projected efficiencies.

Buildings

8.164 Network Rail has forecast buildings expenditure of £1.19bn in CP5 (£1.39bn before efficiencies) as shown in Table 8.20. This compares to a forecast expenditure of £1.28bn in CP4.

Table 8.20: Network Rail's plans, buildings renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	334	311	285	250	214	-	1394
Efficiency	-	9.6%	4.2%	2.0%	3.4%	4.3%	-	21.4%
Post-efficient expenditure	216	302	270	242	205	168	1279	1187

8.165 Network Rail's plans include buildings renewals efficiencies of 21.4% by the final year of CP5. These efficiencies are expected to come from scope efficiencies from its CP5 policies, improved asset management systems, improved planning of work and improved tendering of work.

8.166 Franchised stations account for over half of the total funding requested for buildings and plans have been developed from a modelled approach. Lineside buildings, light maintenance depots and depot plant have also been modelled. Expenditure requirements for the other asset types have been planned using historic levels of expenditure.

Electrical power and fixed plant

8.167 Network Rail has forecast electrical power and fixed plant expenditure of £0.92bn in CP5 (£1.18bn before efficiencies). This compares to a forecast expenditure of £0.80bn in CP4.

8.168 The company's plans include accelerated renewal of electrification assets on the Anglia route, totalling £47m, to address performance issues.

Table 8.21: Network Rail's plans, electrical power and fixed plant renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	284	271	248	199	176	-	1178
Efficiency	-	14.6%	6.1%	4.1%	5.4%	1.2%	-	28.2%

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Post-efficient expenditure	280	243	217	191	144	127	797	922

8.169 The volumes of renewal work proposed for CP5 are markedly different to those forecast to be delivered during CP4. This is a result of significant changes to the asset policy, an increased focus on electrical safety, higher volume forecasts to maintain outputs in CP5 and the impact of enhancement schemes. For example, the CP5 asset policy changes the mix of overhead line renewals compared to CP4. The policy results in a lower volume of re-wiring and campaign changes but a new requirement for mid-life refurbishments as supported by whole life cost analysis.

8.170 Efficiency for electrical power and fixed plant is projected to be 28.2% by the final year of CP5. This efficiency is proposed to be delivered through four key initiatives:

(a) programme optimisation: providing an accurate forward view of planned work to suppliers enabling improved efficiency in the supply chain;

(b) standard scheme design: development of standard designs, where applicable, to reduce design effort;

(c) procurement: using standard specifications and market stimulation to expand the potential supplier base and increase competition; and

(d) delivery model: optimising the mix of work between internal resources and contractors.

Telecommunications

8.171 Network Rail plans expenditure of £0.41bn on telecoms renewals in CP5 (£0.47bn before efficiencies).

Table 8.22: Network Rail's plans, telecoms renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	132	103	100	74	55	-	465
Efficiency	-	8.1%	3.0%	3.3%	2.0%	3.1%	-	18.2%
Post-efficient expenditure	236	122	92	86	63	45	1150	408

8.172 The plans for telecoms show a significant reduction from CP4 levels of expenditure. This is due to large programmes of work related to GSM-R and FTN undertaken during CP4 coming to an end.

8.173 Efficiencies of 18.2% are projected by the final year of CP5 for telecoms renewals. These are forecast to be delivered through scope efficiencies from its updated CP5 policies, improvements to workbank planning, efficiencies from adoption of different technologies and an improved approach to design.

Wheeled plant and machinery

8.174 Network Rail plans renewals expenditure of £0.6bn on wheeled plant and machinery in CP5 (£0.64bn before efficiencies) as shown in Table 8.23.

Table 8.23: Network Rail's plans, wheeled plant and machinery renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	168	122	123	131	94	-	637
Efficiency	-	8.3%	-1.9%	-1.6%	0.0%	0.2%	-	5.3%
Post-efficient expenditure	86	154	114	117	124	89	346	598

8.175 The plans for wheeled plant and machinery show an increase in expenditure compared to CP4. This is largely driven by increased expenditure on road rail vehicles and provision of additional high output fleets.

Other renewals

8.176 Network Rail has put forward proposals for renewal expenditure in other areas. The majority of this is for investment in schemes which the company believes will deliver value for money and/or safety benefits in the long-term.

IT

8.177 Network Rail plans expenditure of £613m on IT renewals in CP5, an increase of £146m compared to CP4.This excludes expenditure on ORBIS. The proposal is based on benchmarking work that the company has carried out, which indicates higher levels of investment by other organisations.

Property

8.178 Property renewals include expenditure on maintenance delivery units, offices and commercial property. The SBP includes expenditure of £124m on property renewals, a reduction of £130m on expenditure in CP4.

Asset information strategy - ORBIS

8.179 The SBP includes plans for the asset information improvement programme ORBIS as discussed previously.

Intelligent Infrastructure

8.180 Network Rail has included expenditure of £95m in its plans for the further roll-out of remote condition monitoring as discussed previously.

Systems for safer working

8.181 The SBP includes a proposal for £100m in CP5 to deliver new technology to provide protection to staff working trackside.

Faster and safer isolations

8.182 Network Rail's plans include £230m proposed expenditure to deliver infrastructure which will allow electrical isolations to be carried out more efficiently and more safely on both the DC and AC networks.

Research and Development

8.183 Network Rail has included £300m proposed expenditure to increase its research and development activity. This level of expenditure has been developed on the basis of the company's benchmarking of expenditure across all sectors.

Renewals – route specific issues

8.184 Route specific renewals plans are set out below, highlighting any deviation from asset policy and central plans.

Table 8.24: Network Rail's plans, post-efficient renewals by route

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Anglia	237	202	229	275	238	202	1146
East Midlands	140	161	146	126	120	109	662
Kent	214	228	221	198	195	206	1049
LNE	445	422	475	443	491	536	2367
LNW	557	546	560	577	539	534	2755
Scotland	243	289	350	306	278	271	1493
Sussex	182	169	187	160	172	154	842
Wales	168	195	157	165	123	115	755
Wessex	200	219	216	261	249	211	1156
Western	303	339	320	307	298	301	1565

Anglia

8.185 Anglia route's most significant challenges during CP5 are the delivery of works relating to Crossrail, the delivery of level crossings safety improvements and the migration of signalling operations to the new route operating centre at Romford. The route sees potential opportunities for deep alliances arising from the re-franchising of Greater Anglia and Essex Thameside. Maintenance and renewals for buildings is already part of the Greater Anglia franchise.

8.186 The route's track plan addresses ageing S&C and poor track quality, with the primary aim being to deliver reliability on the high criticality routes and remove the risk of Temporary Speed Restrictions (TSRs) due to geometry faults and rough rides. An increased percentage of S&C units will be treated either by renewal or refurbishment. Re-railing volumes are slightly higher than modelled to address the high levels of rail defects on the route.

8.187 Proposed signalling work is driven primarily by NOS.

8.188 The route delivery plan contains significant civils renewals including works on major structures (for example swing bridges). The plan notes that full compliance with the new policy will not be achieved until CP6. Buildings work includes major roofing activity at Liverpool Street Station which will continue into CP6. Overall the route's station activity is lower than in CP4 because of the full maintenance and renewal leases awarded to the Greater Anglia franchise which has been assumed to continue when the current franchise is renewed in 2014.

8.189 The reliability of the overhead line equipment in Anglia is considered low and some substation components are being renewed due to obsolescence. A significant volume of lineside 650v signalling power supply equipment will be replaced. The route is continuing the re-wiring of 1940s overhead line equipment between Liverpool Street and Shenfield / Southend.

8.190 There are few major variations to the national asset policies. Track re-railing volumes in the first two years have been increased to address rolling contact fatigue on Essex Thameside and rail defects between Ely and Peterborough. In order to improve performance of overhead line equipment it is proposed to accelerate mid-life refurbishment of equipment on the West Anglia route from CP6 to CP5.

East Midlands

8.191 The East Midlands asset management plan is heavily influenced by two key issues: the development of a signalling workbank to deliver NOS and HLOS requirements, and the electrification of the route between Bedford, Corby, Nottingham and Sheffield. Implementation of NOS results in a significant acceleration of signalling renewals to facilitate major capacity schemes. The electrification of the route results in the requirement to carry out track lowering schemes, bridge reconstruction for gauge clearance and some advancement of renewals works in signalling and structures.

8.192 The route has deviated from policy in certain areas. All bridges will be included in the bridge painting and vegetation clearance programmes.

8.193 Rail renewal volumes are higher than required by policy, driven by the decision to remove all pre-1976 rail. (The rail manufacturing process used before 1976 resulted in rail which is far more prone to developing defects.)

Kent

8.194 Kent's route plan centres on the major challenges around delivery of the Thameslink programme and gaining sufficient access in order to carry out routine maintenance and renewals activities. This is an issue for the London Bridge area and for a number of works requiring high levels of access, such as Charing Cross and Cannon St bridges, Sevenoaks and Bo-Peep tunnels, S&C renewals programme, East Kent re-signalling project and power supply upgrade projects.

8.195 Track geometry in the Kent route has been below target recently due to a combination of drought conditions and insufficient track maintenance (such as tamping and stoneblowing activities). The route's track plans propose an increase in renewal, refurbishment and reballasting of S&C, particularly on the high criticality routes. No high output ballast cleaning is proposed. Plain line refurbishment will be in line with policy and will include removal of obsolete components. Rail renewal plans concentrate on the removal of old and defective rail on the New Cross Gate to Norwood route which sees an increase in tonnage.

8.196 Kent's structures proposals are driven by bridge expenditure including schemes at the major bridges of Charing Cross and Cannon Street. Earthworks are also an issue for the Kent route: the plan reports that 6% of its 478 miles of earthworks are classified as 'poor'. The Kent route also has to deal with the problem of summer shrinkage on clay embankments, which can cause track quality problems.

8.197 Kent is seeking to replace structures which support the rails on longitudinal timbers where there is a business case as they present a maintenance challenge. Signalling renewals are being heavily driven by the Thameslink programme, NOS and migration of control to the new ROCs.

8.198 The route plan does not include any significant variations from the national asset policies.

LNE

8.199 The LNE route asset management plan is dominated by renewal requirements in track, signalling and civils. The track plan incorporates a degree of asset rationalisation and supports the central policy with a shift from renewal to refurbishment depending upon criticality. A significant increase in S&C renewal

interventions is planned, including in the Doncaster and Colton areas. The route plan includes replacement of all pre-1976 rail on high criticality (criticality band 1) lines.

8.200 For signalling, the plan sees the introduction of ETCS on the south end of the East Coast Main Line (ECML) together with a number of renewals and re-controls that will be delivered in line with the NOS strategy.

8.201 The route's plan for structures includes an increase in expenditure over previous control periods to address a backlog of work associated with earthworks and to address deficiencies in capability within the structures portfolio. The route plan identifies a significant issue with historic mineworkings which require continuing investigation and remediation to mitigate the risk.

8.202 The route has proposed additional investment in earthworks beyond the level required by CP5 policy. This is to improve overall asset condition of the asset base to a sustainable level before fully implementing the new policy.

8.203 For electrification and plant, the route is planning to install additional signalling power supply back-up at key locations on the ECML and to replace signalling power cables to improve overall reliability. Additional drainage works over and above asset policy requirements are proposed to reduce operational risk. In addition, the route anticipates accelerating re-wiring of overhead line equipment where delivery efficiencies can be achieved alongside power supply enhancement works.

LNW

8.204 The LNW route plan includes extensive re-signalling work, including at Birmingham New Street, Watford and Wolverhampton. It proposes in-sourcing of repetitive civil structures inspections.

8.205 The plan proposes variance from the asset policies in a number of areas. This includes acceleration of renewals in several asset categories to align with proposed enhancements. For track assets the route will not remove all pre-1976 rail before the end of CP5. For civils it proposes: waterproofing of underbridges where track and formation renewals are being undertaken; improved drainage maintenance access; accelerated replacement of long timber bridges to deliver a modern structure supporting conventional ballasted track; and enhanced bridge strike mitigation measures. For buildings assets the route proposes enhanced measures to reduce energy consumption at stations, a programme of platform reconstructions to address

variance to stepping distance standards and rationalisation of route accommodation. For electrification and plant it proposes some rationalisation and removal of obsolescent assets.

Scotland

8.206 The Scotland route asset management plan is dominated by renewal requirements in track, signalling and civils. Its plans for track include the introduction of high and medium output plant on the ECML and WCML, renewal of slab track in Queen Street Tunnel and increased volumes of off-track work. Its plans for signalling include the migration of Motherwell Signalling Centre to the West of Scotland Signalling Centre and development work associated with deployment of ETCS in CP6. Its plans for civils renewals are based on the remediation of high risk assets for which condition is poor and has been deteriorating in CP4. The civils plan for Scotland includes approximately £40m on major structures, which is approximately 40% of the network total expenditure on major structures. In the Scottish route this work is dominated by the ongoing painting and refurbishment of the Tay Bridge, new work to the Clyde Bridge and routine maintenance to the Forth Bridge which will be necessary despite the completion in CP4 of the major refurbishment work.

8.207 The plan includes some variances to asset policy and, in some cases, reflects changes to route criticality classifications based on their importance to the Scottish network. For track the route proposes higher volumes of sleeper renewal to address non-standard sleepers on high speed routes. The route's signalling plans include renewal of the signal box at Carnoustie driven by the need to renew the adjacent level crossing. For civils the route has included plans to provide slope protection netting on all tunnel approaches and to address legacy issues associated with mining. For electrification and plant the plan includes some advancement of signalling power feeder cable renewals.

Sussex

8.208 The Thameslink enhancement is a key focus of activity on the Sussex route. The condition of the track, signalling and electrification assets on the route has progressively worsened over time to the point where performance is below the PPM targets and reliability is not sufficient to meet the existing timetable. The route is proposing to increase refurbishment of track assets, in particular carrying out more ballast cleaning. It proposes to increase remote condition monitoring to enable

maintenance work to be carried out on a more predictive basis. Some signalling work is being accelerated from CP6 to CP5 as a result of the NOS programme.

8.209 For track the volumes of work are in line with central policy, except where life extension of the asset is not deemed to be whole life cost effective. Sussex has proposed to increase the use of high performance rail in preparation for the Thameslink services from 2018. There are no other significant variances from the central asset policies.

8.210 The Sussex plan includes a significant increase in replacement of metallic structures driven by the high proportion of this type of structure on the route, many of which are over a hundred years old and in need of modern replacement. Proposed earthworks volumes are above network average reflecting the unsatisfactory state of clay embankments on the route, which has a direct link to track quality.

8.211 The Sussex route plan has been built around improving reliability for Thameslink services, with increased traffic levels, an aging asset and reduced access time. There is a focus on re-railing to reduce the pre-1976 rail and manage increased levels of rail defects on the route.

Wales

8.212 The Wales route asset management plan is dominated by renewal requirements in track, signalling and civils as part of a 15 year vision for overhauling its asset base. The route plan is significantly affected by new electrification which is driving bridge reconstructions at various locations and significant signalling renewals in the Welsh Valleys and Port Talbot area, aligning with NOS.

8.213 The signalling plan includes the completion of the Cardiff area signalling renewals and the renewal of the Shrewsbury-Newport and Chester-Llandudno sections which will be delivered in line with the NOS business case for centralising control. The route is coordinating track renewals with re-signalling work to maximise efficiencies in terms of design, capability and access.

8.214 No variances to asset policy have been highlighted within the Wales plans other than the acceleration of activities to coordinate renewal interventions with enhancements.

Wessex

8.215 The Wessex route asset management plan is largely focused on condition based renewals. The route's track condition remains the key area of work for CP5 with rolling

contact fatigue and the general condition of S&C presenting key challenges. Waterloo, the major terminal on this route, will be the focus of various activities with around a quarter of S&C refurbishment taking place in the Waterloo area. Re-signalling of Feltham is the only condition based signalling scheme with the remainder of the signalling work being integrated with NOS. Some enhancements to power supply will be needed to accommodate 10-car operations, but on the whole electrical power and fixed plant assets will follow the national condition based renewals approach. Resilience of assets remains an area of concern and Wessex aims to address this by, for example, introducing dual end fed signalling power systems in critical areas. Wessex is susceptible to risk from heavy rainfall and has focused on drainage as a key risk with respect to both track and earthworks assets. Its structures plans include the removal of higher risk asset types (cast iron and long timbered bridges) over and above the requirements of the policy.

8.216 Although there is no variation to the national track asset policy noted, re-railing is expected to be higher than that modelled centrally due to a number of factors including: volume of pre-1976 rail, excessive side wear on tight curves and the impact of historical tonnage assumptions. For stations, there are two variations to policy noted: maintaining building elements instead of renewal (e.g. lattice girder footbridges and trestle platforms); and life extension of lineside buildings instead of renewal.

Western

8.217 Renewals investment on the Western route is dominated by track, signalling and civils. The plan is significantly affected by major enhancements schemes. Crossrail generates the need for accelerated track renewals between Paddington and Maidenhead to cope with significant increased tonnage. New electrification drives bridge reconstructions and significant signalling renewals in alignment with NOS. In addition significant work is proposed for the Bristol area to coordinate renewal activities and to deliver the capacity requirements outlined in the HLOS.

8.218 Track volumes are in line with policy, targeting pre-1976 rail replacement and ageing S&C on critical routes. Heavier weight rail (CEN 60) will be installed on high criticality routes with increased traffic.

8.219 Structure volumes are being driven by the need to address assets in very poor condition as part of a risk prioritised recovery plan over two control periods. The Western route continues to have difficulties with earthworks reliability and has the

highest proportion in the ‘poor’ category (9% compared with the network figure of 5%). This is reflected in the planned expenditure on earthworks.

8.220 The plan includes some variance to asset policy where renewal activities have been accelerated to coordinate with enhancements. The structures plan includes works to address known issues with a specific bridge type (box girder bridges) and to develop a longer term strategy for coastal defences in Devon, particularly the high profile Dawlish sea wall. Western has a high proportion of issues with historic mining activities, principally Cornish tin mining and the plan includes continuation of a rolling programme to deal with this legacy.

Our assessment methodology – maintenance and renewals

8.221 In July 2011 we consulted on our proposed methodology for the assessment of Network Rail’s plans. After consideration of the responses we refined our methodology, developing workstreams to focus on:

(a) asset management capability;

(b) asset policies;

(c) asset data;

(d) unit costs (pre-efficient);

(e) planning - modelling and workbank development; and

(f) efficiency.

Each of these areas is discussed in the subsequent sections of this chapter.

8.222 Prior to the submission of the SBP we, and the independent reporters, engaged with Network Rail to understand the process it was adopting in developing its plans by route and to allow early review of them where practical. We called this engagement ‘progressive assurance’. Progressive assurance provided some early sight of the process being adopted but did not provide the opportunities for early review which were originally envisaged as Network Rail did not submit the expected level of evidence in advance of the SBP and provided limited engagement with the routes prior to its submission.

8.223 In our assessment of the SBP we have separately considered:

(a) the volumes and level of expenditure required to deliver the required outputs, before further efficiencies in CP5; and

(b) the efficiency available in CP5 and therefore the efficient level of expenditure in CP5.

8.224 We have assessed all stages of the development of Network Rail's plans through the detailed review by our engineering experts and through independent reporter work. Figures 8.5 and 8.6 show our interpretation of the high level processes Network Rail has used in developing its maintenance and renewals plans, with colour coding applied to show our assessment process. The colour of each box in the diagrams indicates the reporter study which reviews it. The diagrams are intended to give an overview and do not show the full complexity of the processes adopted or review and feedback loops.

8.225 Both Figure 8.5 and 8.6 show our assessment of Network Rail's plans in four areas:

(a) the development of its CP5 asset policies;

(b) the central modelling of volumes and costs (including efficiencies) associated with implementing those policies;

(c) the route based development of volumes and costs (including efficiencies) associated with implementing those policies; and

(d) the development of Network Rail's submitted SBP.

8.226 Figure 8.5 shows that, for maintenance, policy development and central modelling has been carried out, but our assessment has found insufficient evidence of how these areas of work have fed into the final SBP submission. In particular, the line of sight between asset policies and maintenance plans presented in the SBP is not clear. The maintenance plans are largely based on projections of resource requirements that have not been demonstrated to be aligned with policy requirements. There has been limited challenge between centrally modelled cost and resource based cost forecasts. Network Rail has not demonstrated a robust route challenge to centrally derived efficiency initiatives.

8.227 Figure 8.6 shows that renewals plans are developed based on the requirements of asset policies. Asset policies are based on whole life cost modelling and rely on understanding of unit costs, degradation and the impact of interventions. They also

rely on specification of the outputs which they are intended to deliver. We have some concerns over the specification of outputs, discussed later.

8.228 For renewals, asset policies have generally been demonstrated to feed into both central modelling and route based plans. In both cases the volumes and costs associated with implementation of the policies are developed using understanding of the asset base (for example, the number of assets and their condition), cost information (including unit costs of work activities), understanding of degradation and efficiency initiatives. We have seen evidence of a challenge process between central and route based plans in all aspects of the planning process. The final SBP submission is a result of that challenge process.

Figures 8.5: Our assessment of Network Rail's maintenance plans

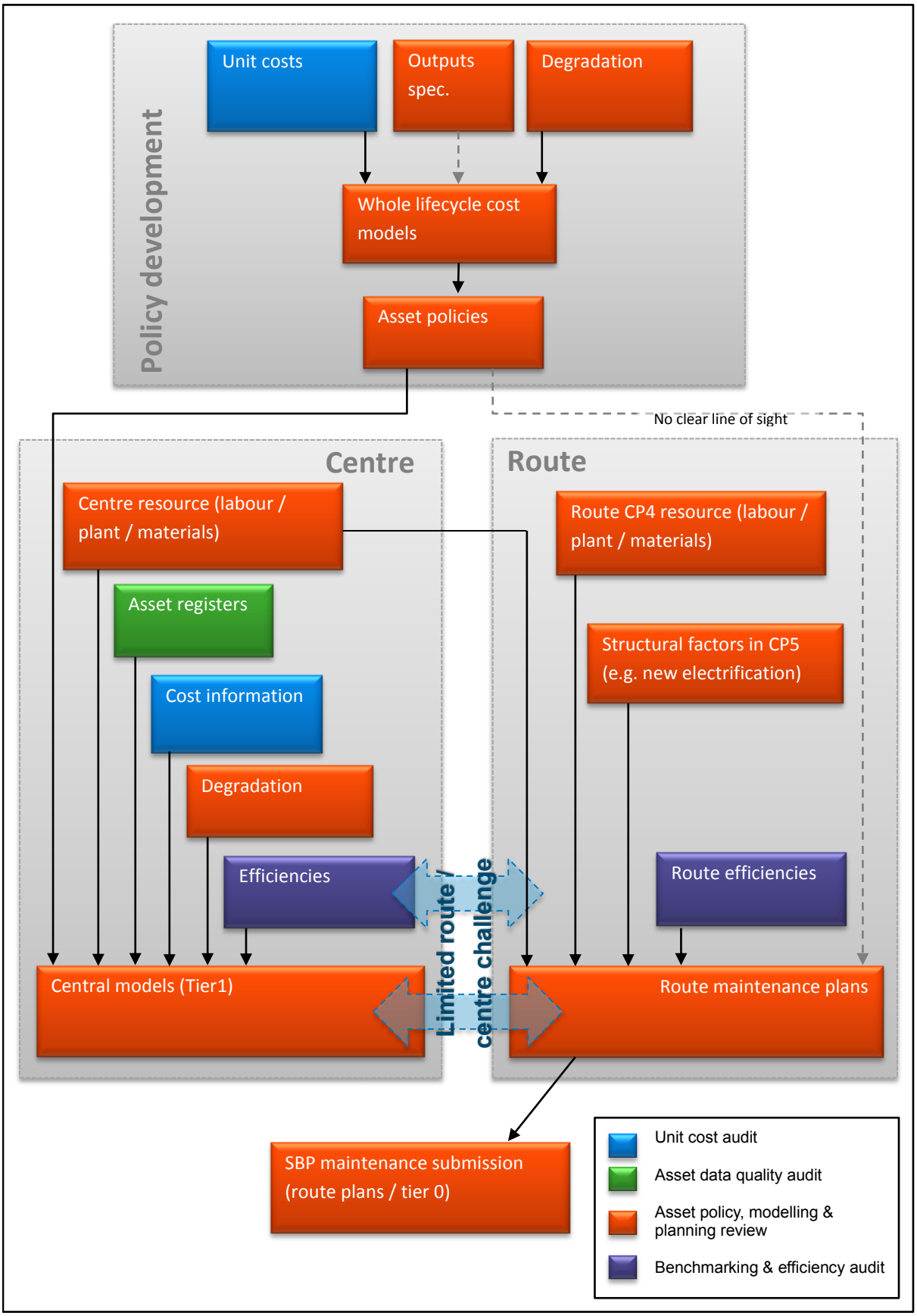
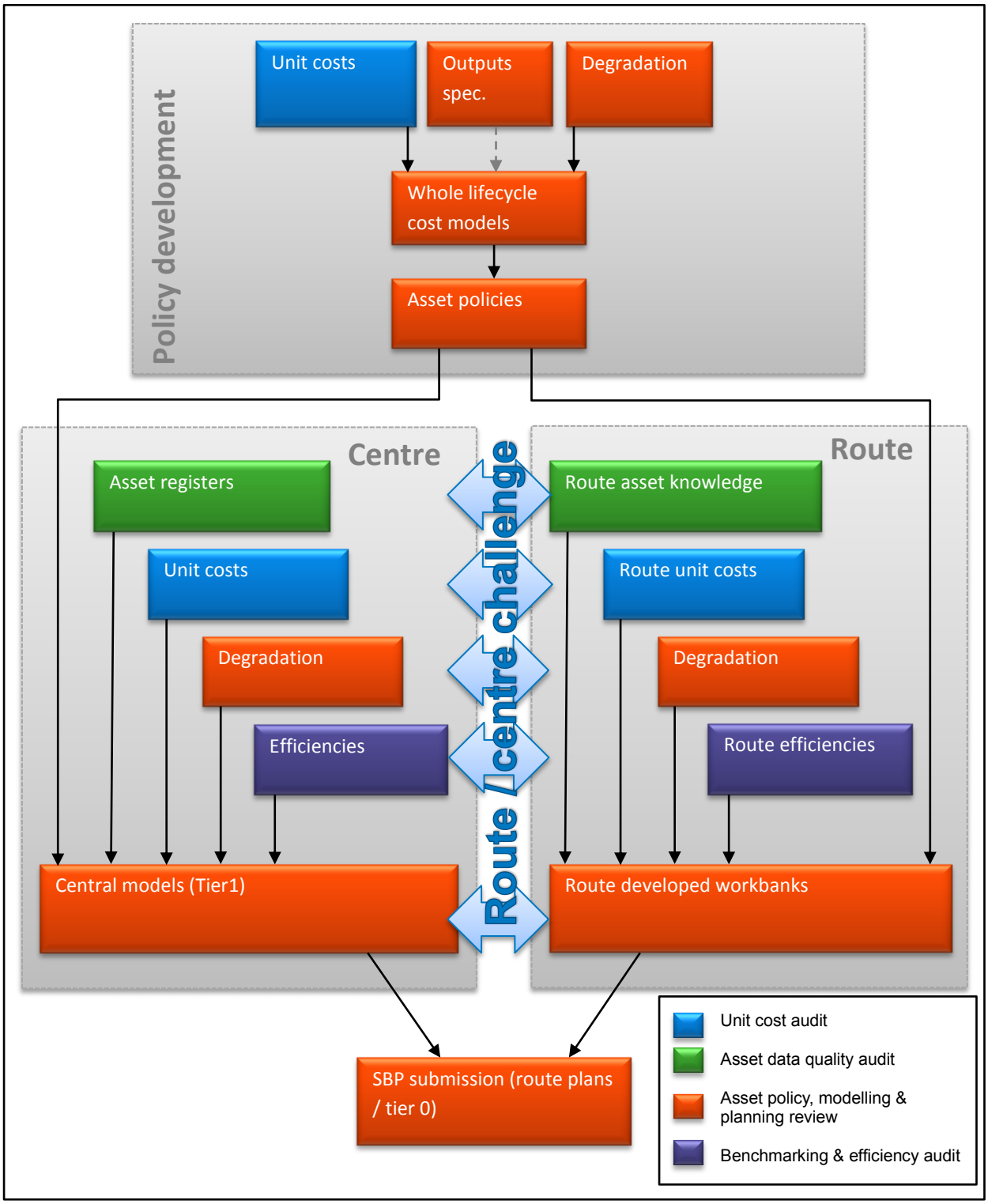


Figure 8.6: Our assessment of Network Rail's renewals plans

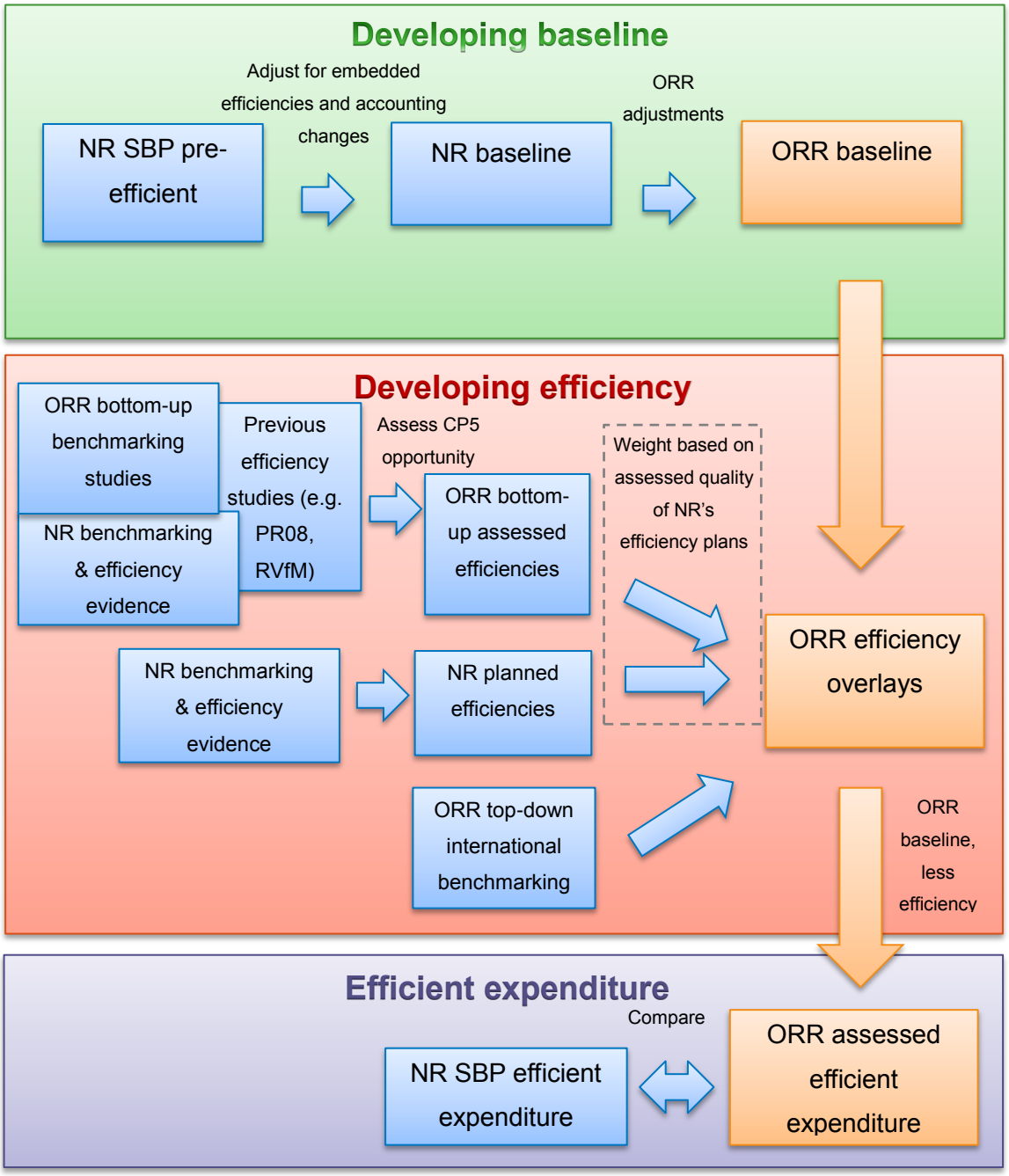


8.229 As well as auditing Network Rail's development of its plans we have carried out our own assessment of the efficiencies that are available through improved asset management. This is discussed in detail later in the chapter.

8.230 Where our review has found material issues with Network Rail's planning process that are likely to lead to a bias in its forecast costs and volumes we have made adjustments to reflect this.

8.231 Figure 8.7, below, gives an overview of the approach adopted.

Figure 8.7: Our approach to developing our assessed efficient maintenance and renewal expenditure



Developing the ORR baseline

8.232 Network Rail's pre-efficient plans are presented on the basis of applying its new asset policies and unit costs as at the end of CP4. In some cases its new policies are considered to be more efficient than current practice, requiring less work to be done to give the same outputs. These efficiencies are embedded in the new policies and are referred to as 'embedded efficiencies'. Since these are efficiencies that Network Rail proposes will be delivered in CP5 we have adjusted the pre-efficient plans to recognise them and generate a 'Network Rail baseline'.

8.233 We have made adjustments to the Network Rail baseline where we do not consider that it accurately reflects the costs associated with continued application of CP4 policies and the end-of-CP4 level of efficiencies. For example we have made adjustments where we believe that its end-of-CP4 unit costs are inaccurate. These adjustments generate an 'ORR baseline'.

Developing the ORR efficiency overlay

8.234 Our efficiency overlay is influenced by the studies that we have commissioned in PR13, our review of all previous efficiency studies, our top-down benchmarking and our view of the robustness of Network Rail's benchmarking and efficiency evidence, informed by the independent reporter's audit.

8.235 In developing our final view of the efficiency overlay we have weighted the results of our bottom-up efficiency analysis and Network Rail's efficiency analysis based on our assessment of the quality of the company's benchmarking and efficiency work. This draws on the outputs of the independent reporter's audit. Where we have more confidence in Network Rail's efficiency projections (for example where we think its benchmarking has been comprehensive, robust and there is transparency in how this has informed its SBP efficiencies) we have applied more weight to its view of efficiency. Where Network Rail's efficiency plans are considered weaker (for example where we think that benchmarking is less comprehensive or where there is a less transparent link between benchmarking and SBP efficiencies) we have applied more weight to our analysis.

8.236 Finally, we have reviewed the efficiency overlay against the range of efficiencies produced by our top-down international benchmarking.

Developing ORR assessed efficient expenditure

8.237 We have applied our view of the efficiency available during CP5 to the ORR baseline to produce our ORR assessed efficient expenditure. This can be directly compared with Network Rail's efficient expenditure (or 'post-efficient' expenditure) as set out in its SBP.

Our assessment of route plans

8.238 We and the independent reporters, Arup and AMCL, have carried out a detailed assessment of plans by operating route. The assessment has included:

(a) review of the route specific SBP submissions, including route plans and disaggregated costs and volumes data;

(b) review of the SBP development process adopted, including the development of central modelled plans and route-based plans, and their influence on the submitted SBP;

(c) ten overarching route based challenge meetings: one with each of the ten operating route management teams; and

(d) 34 meetings to assess the development of asset management plans in the routes.

Interoperability

8.239 Interoperability is a European Commission initiative to promote a single market in the rail sector, which includes making it easier for trains to travel across different rail networks. This is partly achieved through common specifications called Technical Specifications for Interoperability (TSIs). Statutory requirements for interoperability are set out in The Railways (Interoperability) Regulations 2011.

8.240 The SBP included the assumption that planning for an interoperable railway would not require specific additional costs in CP5 beyond existing levels of capital expenditure. Network Rail's planned expenditure for maintenance, renewal and enhancements is assumed sufficient to meet the requirements of the interoperability regulations and the TSIs, and therefore our determination is also on this basis.

Our assessment by workstream

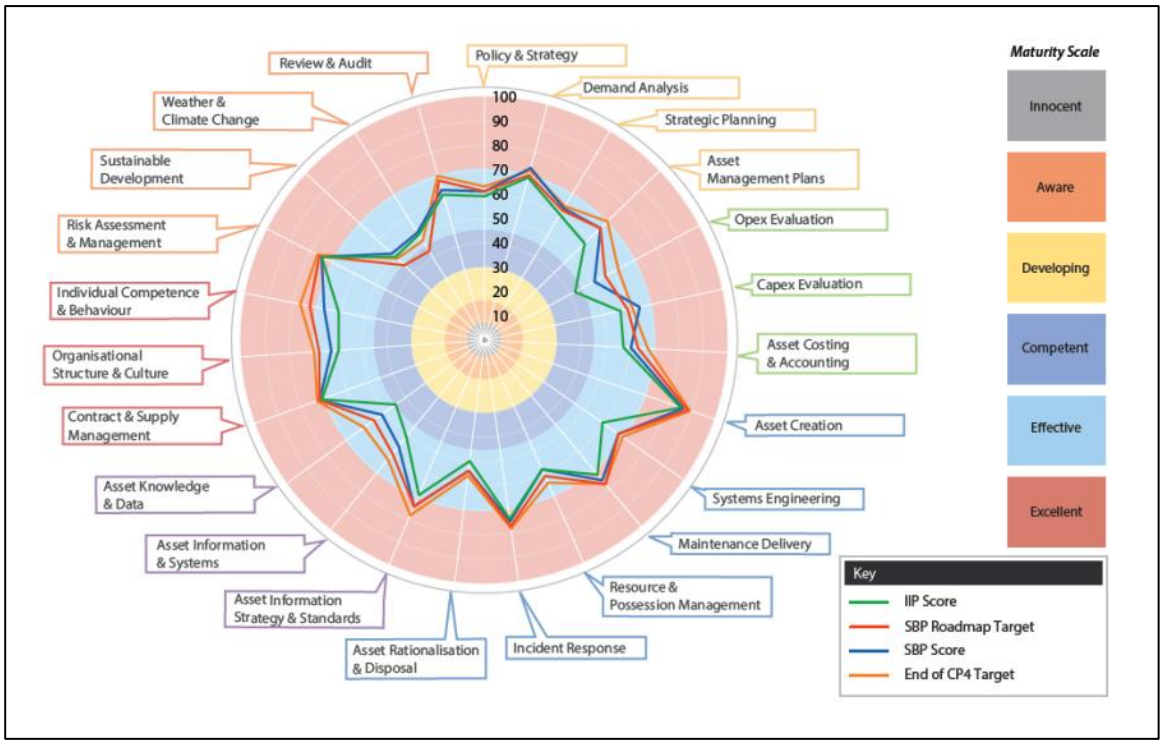
8.241 The rest of this chapter sets out the findings of our review and our conclusions. First it sets out our overarching findings against the workstreams listed in paragraph 8.221 and then it provides detail by asset category and route.

Asset management capability

8.242 During CP4 we set targets for Network Rail to improve its asset management capability by the end of CP4, including milestones at publication of the IIP and at publication of the SBP. Network Rail has not fully delivered against these milestones, but has nonetheless made significant improvement in its capability and has achieved PAS55 certification (the standard that denotes it has reached a level of good practice).

8.243 Figure 8.8 shows Network Rail's assessed asset management capability at the time of the SBP submission as measured by AMEM[133]. Asset management capability is measured for each of 23 key activities, with lower scores (closer to the centre of the circle) representing lower asset management capability maturity and higher scores (closer to the perimeter of the circle) representing higher asset management capability maturity.

Figure 8.8: Network Rail's asset management capability at SBP submission as measured by AMEM



8.244 The AMEM findings show that Network Rail has further improvements to make in some key areas of asset management to reach its end-of-CP4 target. At the time of

[133] *2013 SBP AMEM Assessment*, AMCL, May 2013, available at: http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php

the SBP submission it was significantly behind its targets in opex evaluation (i.e. the justification of maintenance interventions based on analysis of cost and risk), asset costing and accounting, resource and possession management, asset information and systems, asset knowledge and data, organisational structure and culture, individual competence and behaviour, and review and audit.

8.245 The AMEM findings provide strong support to our assessment of Network Rail's plans and the areas in which further efficiencies might be available. Further improvements in its asset management capability will be key to enabling efficiency improvements in CP5. We have set asset management capability targets as regulated outputs as discussed in chapter 3.

8.246 We discuss Network Rail's approach to asset management in more detail below, including by asset type and route.

Asset policies

8.247 We have carried out a detailed review of Network Rail's asset policies and their justification. We have set out our framework for reviewing asset policy, including tests of robustness, sustainability, efficiency (of policy, in terms of minimum whole life, whole industry cost (abbreviated to 'whole life cost' in this document)) and further tests of alignment with good practice, consistent with PAS 55.

8.248 In assessing robustness we consider whether it is reasonable to believe that the asset policy can deliver the required outputs, for England & Wales and Scotland in CP5.

8.249 Our assessment of sustainability considers whether, if demand on the network were to remain steady, the application of the asset policy would continue to deliver the outputs specified indefinitely. A sustainable asset policy is one which delivers (at least) the agreed outputs for the final year of the control period in the long-term (to at least end of CP11) if demand on the system remains within the capacity limits of the current network and any enhancement schemes already committed to by industry. In assessing sustainability we have carried out a detailed review of Network Rail's long-term modelling of policy and outputs, either through long-term workbanks or strategic planning models. This test is important to ensure that, in managing its assets, Network Rail is making genuine efficiencies and is not deferring essential work at the cost of inefficiently higher expenditure in later control periods.

8.250 Our assessment of the efficiency of asset policies considers whether they have been demonstrated to deliver the required outputs both in the short and long-term at lowest possible whole system cost over the lifetime of the assets. In assessing minimum whole life cost we have considered whether both scope and unit cost efficiencies have been fully considered.

8.251 Network Rail has made significant progress in developing and justifying its policies. In particular it has, for the first time, produced a suite of tools to support its development of minimum whole life cost asset policy. The tools are considered to be comparable to or at the frontier of best practice.

8.252 Network Rail has significantly reworked its policies, presenting them in a ten stage process, in line with best practice as recommended by the asset management independent reporter, AMCL. They show a step-change in quality and coverage. New policies have been developed in key areas and existing policies have been refined where previously mature (for example, track) or rewritten where known to be poor (as is the case for civil structures policy).

8.253 The CP5 policies reflect a further move towards the differentiation of asset interventions depending on the asset's criticality, and therefore better target expenditure on the basis of risk. They also move towards a more targeted approach to asset management, renewing only those components that require renewal where this is believed to be the most cost effective whole life approach.

8.254 Although Network Rail has made significant progress in the development and justification of its asset policies we consider that some areas of weakness remain. Deficiencies in Network Rail's asset knowledge limit its ability to demonstrate that its policies are fully optimised. Network Rail still does not have asset data knowledge of sufficient quality, in particular relating to asset degradation. Its knowledge of asset unit costs and application for the purposes of planning is currently not of sufficient quality to provide certainty in its proposed asset policies and in its planned expenditure in CP5.

8.255 Network Rail has not optimised management of its assets across asset types. It has not considered whether network performance might be delivered better through a different mix of performance at the asset category level. The company has not

demonstrated that it understands the relationship between its asset management plans and high level outputs such as PPM.

8.256 Network Rail's application of its CP5 asset policies in its planning is varied. For maintenance there is limited evidence of its policies feeding into its SBP submissions. For renewals the application of policy is generally stronger for track, signalling and electrical power and fixed plant. It is weaker for civils and buildings. We discuss this in more detail in our assessment by asset type.

Asset data

8.257 The quality of asset management planning is entirely dependent on the quality of information held about the assets, and the asset system more widely. We have expressed serious concern about aspects of Network Rail's asset information systems and data quality management and have pressed for improvement. Network Rail has recognised the need for improvement. It has undertaken a programme of work, the Asset Data Improvement Programme (ADIP), to enhance the accuracy and currency of its asset information. Improvements have been prioritised to support development of the SBP and to support effective and safe maintenance of the railway. Network Rail has also set out its longer term strategy for developing asset information management capability in its ORBIS plans. This programme of works is intended to change the way in which asset information is collected, stored and used, with the aim of improving railway safety, efficiency and capability.

8.258 We mandated the independent reporter, Arup, to conduct an extensive audit of Network Rail's asset data processes and resulting data quality, in part to understand the implications for the quality of the company's plans for CP5[134]. This audit has given us and Network Rail a more comprehensive understanding of the company's asset information systems, the quality of the processes through which asset information is maintained and the completeness and accuracy of the data held. The reporter separately audited:

(a) Network Rail's data governance and capture processes; and

(b) the actual data held, assessing its completeness and accuracy.

[134] *Audit of asset data quality*, Arup, May 2013, available at http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php

8.259 The audit found some areas of good practice in Network Rail's data management. Data governance was generally found to be good, but it was noted that processes have been implemented recently and may not yet have impacted on currently held data. Data capture and entry processes were found to be sound for centrally managed data systems and consistency was found in the datasets used centrally and by routes in developing the SBP. The delivery unit teams were able to demonstrate good local data management through the System Support Manager role and the use of Ellipse as the primary asset management system. The completeness and accuracy of data held was found to be relatively better for plain line track, operational property, signalling interlockings, level crossings and overhead line equipment.

8.260 The audit also found aspects of data management that were poor and which represent key areas of concern. The completeness and accuracy of data held was found to be poor for civil structures and conductor rail. (Subsequently Network Rail has been working to improve civils data.) Local data governance was found to lack formal process. Some local databases were not integrated to ensure consistency and efficiency. Route teams were found to be adopting inconsistent approaches to reviewing and verifying data quality.

8.261 Going forwards it is essential that Network Rail is able to demonstrate that it understands its asset information requirements, has the systems and processes in place to deliver those requirements and is auditing the quality of asset information held. Through the ADIP and ORBIS programmes it is developing these areas and we will monitor its progress closely. We have set out how we plan to monitor asset information quality in chapter 3.

8.262 The quality of asset information affects our view of the robustness of Network Rail's plans. For example, poor quality information may lead to inefficient targeting of work, inappropriate prioritisation of workbanks and uncertainty over the scope of work required. Our efficiency analysis has considered the efficiencies which might be available from improved asset information.

Unit costs

8.263 It is essential that Network Rail has a robust unit cost framework in place for both maintenance and renewals. A complete, up-to-date and accurate set of unit costs enables accurate business planning, more reliable benchmarking of costs, identification of efficiency opportunities, demonstration of achieved efficiencies and

development of asset policies that minimise the whole life cost of managing Network Rail's assets.

8.264 We have assessed Network Rail's unit cost frameworks for maintenance and renewal looking at both the quality of reported data, and the processes by which these data are used to develop a forecast of unit costs for the purposes of planning.

8.265 In May 2011, we wrote to Network Rail[135] to set out our expectations for its unit cost framework at SBP in terms of system reliability, accuracy and coverage. We stated a requirement for both maintenance and renewal related unit costs to achieve a confidence grading of A2 at the time of submission of the SBP. The company has put a substantial amount of work into improving its capture and reporting of unit costs. We have, through the independent reporter Arup, audited Network Rail's unit cost framework at SBP[136]. The company has not yet achieved the level of system reliability that was expected. Arup gave Network Rail's unit costs relating to renewals a confidence grading of B2. It found that the cost analysis framework (CAF), through which the majority of unit costs relating to renewals are captured, does not appear to capture all project costs for certain asset categories through the GRIP stages. In addition the company has not demonstrated that its maintenance unit costs were at confidence A2 at the time of submission of the SBP. This has implications for the robustness of Network Rail's policy development, planning, benchmarking and its ability to demonstrate realisation of efficiencies.

8.266 Further to the above audit of actual (delivered) unit costs we have also audited, through the independent reporter Arup, the quality of the unit cost information which has been used in developing the SBP. This may be different to actual unit costs for reasons including: further efficiencies to the end of CP4; new work types projected for CP5; and better information about future unit costs (for example information from new contract placements).

8.267 For all asset types Network Rail's plans are based on a mixture of unitised costs, non-unitised costs and project cost estimates. Unitised costs are used to develop plans covering 44% of maintenance and renewal expenditure. For maintenance, none of the

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[135] http://www.rail-reg.gov.uk/upload/pdf/unit_costs_letter-090511.pdf

[136] PR13 review of Network Rail's maintenance and renewal unit costs used in planning, Arup, May 2013, available at http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php

plans is based on unitised costs. Of the renewals expenditure plans roughly 61% is based on unitised costs, 30% is based on non-unitised costs and 9% is based on project cost estimates. Generally, more certainty can be attributed to those areas of expenditure where Network Rail has forecast expenditure on the basis of required volumes and costs, or on the basis of well-developed project cost estimates. There is generally less certainty where forecast expenditure is based on historic costs rolled forward.

8.268 Network Rail has not directly used its collected maintenance unit costs in its planning for CP5. Its maintenance plans have been developed on the basis of historical levels of resource expenditure and not through the quantification of types of work and their cost of delivery. It carried out some central modelling of volumes and associated costs for the IIP, but there has not been any clear demonstration that this has been used to develop or evaluate the costs presented in the SBP. The limited use of historical maintenance unit costs in the development and validation of Network Rail's plans is disappointing and, because plans are not based on volumes and types of work activity, the line of sight from optimised policy to planned expenditure is not clear.

8.269 Network Rail has used its historical unit costs relating to renewal to varying degrees in developing its renewals plans. For some assets its plans are largely based on historical unit costs (for example track, earthworks and drainage). For other asset categories it has priced elements of its work activities based on labour, plant and materials costs using estimating techniques (for example, electrification and power, and buildings). For signalling the unit costs used are based on average framework signalling unit rates with a number of Network Rail overlays. In all cases factors have been applied to generate the all-in unit cost at the end of CP4. We are concerned that the systems currently being used for the capture of unit costs are not currently capturing them at an appropriate level, using a cost breakdown structure that reflects the requirements of the business planning process.

8.270 Arup has identified some key concerns with the unit costs and non-unitised projections used. Where expenditure is based on rolling forward non-unitised costs there is high potential for over-forecasting of expenditure. The process used for challenge of plans has focused effort on justifying expenditure which is greater than run-rate, and has not placed enough emphasis on justifying a continuation of historical levels of expenditure. For unitised costs based on historical spend there is potential

for costs to vary due to the underlying mix of work types, for example where historical volumes of a work type are considerably different to those projected. Network Rail has not provided any evidence of analysis to assess the effect of these issues. For all unit costs there is concern that the level of risk, contingency and management overhead costs have not been given adequate oversight at the programme or portfolio level. This has high potential to lead to an overestimate of risk and contingency. Findings by asset category are presented below.

8.271 We consider that further efficiencies can be achieved through a more robust understanding of unit costs, optimising the performance and cost trade-off, optimising asset policies, using the information to inform better supply chain management and understanding better where efficiencies might be achieved through comparative analysis.

Modelling and workbank development

8.272 Network Rail's plans are built up either by forecasting the volumes of work required or resource requirements, and projecting associated costs. This forecasting is carried out both centrally, using strategic planning models, and by the development of route workbanks.

8.273 Strategic planning models forecast expenditure in two ways: based on volumes of work multiplied by unit costs (unitised); and based on extrapolation of historical costs (non-unitised).

8.274 Volume based modelling uses current information held about the assets, forecasts the assets' degradation and applies interventions, as set out in its asset policies, to forecast the volume of work required. It then applies unit costs to forecast expenditure requirements. Modelling based on extrapolation of historical costs is a more basic approach but is appropriate where there are no clearly defined repeated work types or where the run-rate of expenditure gives a more accurate forecast of future expenditure.

8.275 The independent reporters, Arup and AMCL, have audited Network Rail's strategic planning models for all asset categories, assessing:

(a) input data (are the input data consistent with asset data registers, degradation modelling and unit cost modelling?);

(b) computational accuracy (do they function as intended?);

(c) modelling principles (are they modelling policy accurately?);

(d) model uncertainty (what is the range of uncertainty in modelled outputs?); and

(e) model outputs (are the outputs accurate and are they fed through to the SBP submission?)

8.276 The audits found that modelling varied by asset category, including the extent to which the modelling represented application of asset policy. There was wide variation in certainty of inputs and outputs. Computational accuracy was, in general, found to be good. Our key concerns are:

(a) the quality of maintenance modelling and the extent to which it has been used in development of the SBP submission;

(b) civils structures modelling of asset policy, its inputs and therefore outputs;

(c) franchised station modelling of asset policy, its unit cost and degradation inputs; and

(d) fencing modelling of asset policy and inventory input data.

8.277 We present our modelling findings in more detail in our review by asset type.

Our assessment of route plan development

8.278 We have seen evidence of a challenge process between centrally modelled plans and route based plans, but the strength of this varies between asset groups. For example, challenge of track plans has been relatively good, whereas for buildings we have seen limited evidence of routes challenging centrally modelled numbers. Despite this variability, the process implemented has worked to improve the quality of plans by operating route.

8.279 Both modelling and route based plans are built on route specific asset information and unit costs which, to some extent, reflect the structural factors in routes.

8.280 In some instances routes have used route-specific unit costs and efficiencies where they believe they have better local information. Routes have considered local constraints in their plans.

8.281 Overall we consider that Network Rail has applied a suitable process for the development of route plans. However the late running of the process has led to some

inconsistencies in plans. Robustness of plans by route is still dependent on accurate route based unit costs. These vary significantly in quality and they are not yet tested.

Climate change and resilience

8.282 An overarching consideration in our assessment of Network Rail's maintenance and renewal plans has been the extent to which they have addressed climate change and resilience of the network both in the short- and long-term.

8.283 Network Rail, in conjunction with RSSB, has undertaken extensive research to understand likely future climate change scenarios and has led the industry's initial response to the Climate Change Act 2008.

8.284 Whilst it is clear that Network Rail has developed its understanding of the impact of climate change on some elements of its infrastructure it is imperative that this understanding is developed further for all assets and, in particular, for earthworks and drainage. We therefore require Network Rail to update its Climate and Weather Resilience document to include a strategic review of the key nodes in its network. The updated document must demonstrate how Network Rail has assessed the risk associated with climate change at those key nodes and how it has assessed the need for measures to improve their resilience. For example, it should consider whether it is economic to provide flood protection at critical locations and, if not, what measures should be taken to ensure that the railway is recovered back into operational use as soon as reasonably practical in the event of flooding.

8.285 The CP5 asset policies generally contain improved consideration of climate change. However we have not seen evidence that these elements have been embedded in Network Rail's standards and specifications. Specific consideration needs to be given to:

(a) specification of new components / equipment / systems to provide robust performance for anticipated climate scenarios over the design life. For example, Network Rail might consider including projected climatic ranges in the specification of new systems such as overhead line, track and structures.

(b) evaluation of existing systems to identify and justify interventions to improve resilience to projected climate change. For example, Network Rail might consider increasing tension in overhead line systems to reduce the likelihood of

dewirement due to high wind speeds, or improvements to sea defences to mitigate changes in tidal reach.

(c) review and amendment of existing operating and maintenance practices to improve mitigation of the impact of climate change. For example, Network Rail might review its maintenance practices to improve management of climate driven failure modes or alter its stressing ranges for running rails.

Our assessment of maintenance and renewal efficiency

8.286 In developing our view of the overall potential for Network Rail to realise efficiencies in CP5 we have considered a wide range of evidence, including:

(a) Network Rail's benchmarking for PR13, which we have reviewed;

(b) benchmarking studies which we have commissioned for PR13;

(c) previous studies carried out, from which we have identified efficiency opportunities remaining at CP4 exit (including all PR08 work, RVfM study, reporter work and external studies);

(d) evidence from our engineering experts and safety audits;

(e) our overarching efficiency opportunities, relevant to all areas of expenditure (for example improved management of inflation); and

(f) our top-down econometric modelling, which uses mathematical techniques to benchmark Network Rail against comparators and assess how much more efficient it would need to be to match the best performers.

8.287 We summarise some of the key evidence considered below.

Maintenance and renewal efficiency – our studies

8.288 We have conducted a suite of benchmarking studies for PR13, including benchmarking against international comparators (both within and outside Europe) and comparators from other industries. Our studies have benchmarked asset management, possession management, supply chain management, project and programme management, innovation and maintenance strategy. All of these studies

have identified opportunities to realise further efficiencies during CP5. The reports are available on our website[137]. Some of their key findings are summarised below.

Asset management

8.289 The independent reporter, AMCL, has conducted an assessment of Network Rail's asset management capability as described earlier in the chapter. It has considered emerging evidence in comparable sectors to identify the efficiencies which might be realised in CP5 through improved asset management. The reporter estimates that Network Rail could identify 15 to 20% maintenance savings and 10 to 15% renewals savings from more risk-based renewal and maintenance interventions alone. It has also identified many opportunities to improve the planning and delivery of work which all have the potential to reduce the costs of engineering works over the lifetime of the assets.

8.290 We have separately commissioned a study by Civity to consider the scope of savings which might be available from better asset management. Civity's report draws on a range of evidence concerning Network Rail's asset management and supports many of the findings from the AMEM review. The report concludes that the range of potential savings is wide but is in line with the findings of the RVfM study.

Possession management, Lloyds Register Rail

8.291 We commissioned a study to benchmark the efficiencies which might be available during CP5 from the improved management of possessions. The study carried out benchmarking using six international comparators, including ones from North American, Asia and Australasia.

8.292 Six key themes were identified:

(a) delivery of engineering work: Network Rail's unit costs appear high. The gap to comparators has been measured across a wide range of studies as being between 10 and 40%, partly due to differences in engineering access;

(b) timing of engineering access: Network Rail relies largely on longer weekend possessions, whereas comparators were found to use overnight possessions in which dedicated, multi-skilled teams deliver repeatable maintenance and renewal activities. Some comparators extend track time through adjacent line

[137] http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php

open operation. Productivity, quality and unit costs are improved through use of a full time workforce. This approach has the potential to lead to substantially increased revenues;

(c) invest in maintainability: the study considers that Network Rail's approach to asset management has been characterised by lowest first cost and benefits could be realised from greater consideration of costs over the lifetime of assets. Comparators invest more heavily in infrastructure to provide improved train routing, faster isolation and low maintenance track. It highlights the opportunities presented by the ERTMS programme;

(d) planning processes: Network Rail books engineering possessions early, which results in more reworking of plans. Contractors are involved later, and pathing of engineering trains can also occur later. There are inconsistent links to the timetabling process. Devolution presents a big opportunity for improvements;

(e) contracting policy: Network Rail involves contractors late in the process resulting in late re-working of plans. It tenders work in smaller packages. Its contracting strategy has resulted in use of a casual workforce, resulting in lower quality, loss of learning and the requirement for more prescriptive safety processes; and

(f) possession management: Network Rail's productivity is comparatively low. It is slower at carrying out isolations and has more prescriptive safety rules which result in slower uptake and hand back of possessions. It plans for greater contingency, both in terms of the equipment required and time to hand back possessions and yet its possessions result in more disruption to services. Benchmarking suggests that Network Rail typically achieves 3.5 hours of productive time out of an 8 hour possession, whereas comparators typically achieve 6.5 hours.

8.293 The study suggests that the benefits potentially available from improved possession management are between £50m and £150m per year. It considers that benefits to the wider industry might be greater, resulting from increased revenues and reduced operational costs.

Supply chain management

8.294 Civity reviewed Network Rail's supply chain management against 'world class' practice and identified some significant gaps in capability. It found key areas for improved efficiency including:

(a) better workbank planning with improved smoothing and longer term visibility to give its supply chain greater opportunity to optimise its resource management;

(b) application of a more collaborative approach to supplier engagement;

(c) further standardisation and modularisation of assets;

(d) adoption of industrial processes to deliver work more efficiently;

(e) improved access arrangements and higher productivity;

(f) a leaner but higher skilled procurement function;

(g) further development of the cost database and unit cost modelling; and

(h) further benchmarking against international peers to identify efficiency opportunities.

8.295 Civity concluded that efficiencies of £300m to £400m per year might be achievable in CP5 from improved supply chain management.

Project and programme management, Halcrow

8.296 We commissioned Halcrow to review Network Rail's project and programme management capability and the efficiencies which might be available from improvement.

8.297 The following key opportunities were identified:

(a) a greater focus on programmes of work to understand system-wide issues and benefits – rather than a more narrow focus on projects;

(b) a greater focus on the development phase, reducing the time to develop schemes;

(c) a more collaborative approach in use of the supply chain, reducing the need for duplicated resource;

(d) a move to more output based procurement, allowing greater innovation in the supply chain;

(e) improved whole life cost analysis, particularly for new infrastructure, to optimise option selection for investment decisions;

(f) improved early estimating and improved analysis of changes in scheme costs through their lifecycle;

(g) reduced inefficiencies in managing projects and improved automation of reporting systems to reduce opex costs;

(h) improved project and programme management capability and therefore improved efficiency;

(i) improved transparency in project reporting; and

(j) application of best practice project and programme management across the business – including in maintenance and renewals.

8.298 The study identified that efficiencies were available in maintenance and renewals but did not quantify those savings. Many of the themes identified above are relevant to maintenance and / or renewals. We have taken this into account in our analysis.

Innovation

8.299 We commissioned Balfour Beatty RailKonsult to conduct a study into the efficiencies available to Network Rail from best practice innovation and the introduction of technologies which are new to the railway in Great Britain. The study separately considered: innovation process best practice; a scan of innovations applicable to rail; an assessment of the potential value of innovation during CP5. It recognised that much work has been undertaken in the last two years to improve the innovation process. Through its benchmarking RailKonsult identified significant opportunities for the rail industry to improve its innovation practice, including:

(a) setting clearer objectives;

(b) developing a long-term technology plan;

(c) simplifying industry interfaces;

(d) improving understanding of the link between research and development and return on investment;

(e) developing dedicated specialisms and centres of excellence; and

(f) reducing 'fear of failure' culture.

8.300 The study noted that the rail industry spends less on research and development than other industries.

8.301 The study identified a range of innovations which were either not included in Network Rail's business plans or for which it considered greater efficiencies could be realised. These included: mobile maintenance units, under-sleeper pads, staff protection systems, improved recycling of components, chemical treatment of timber bearers, improved system monitoring, non-intrusive crossovers, modular level crossings, improved use of ground penetrating radar technology, repadding machines, specialist gantries, plastic sleepers, improved modelling of bridge behaviour and new overhead line component technologies. An assessment of the potential benefits that might be available from implementation of these innovations in CP5 was carried out, concluding that the range was £57m to £113m.

Maintenance strategy

8.302 Potential to gain efficiencies by optimising maintenance strategy on the basis of risk has been identified by several previous studies. We commissioned Balfour Beatty RailKonsult and AMCL to carry out a benchmarking study to identify best practice maintenance strategy and the efficiencies which might be available through its adoption. This was informed by AMCL's extensive asset management best practice analysis and benchmarking, including international and cross-industry benchmarking.

8.303 The study identifies core themes for comparison of identified best practice with practice as currently seen in Network Rail: strategy and planning, decision making, asset knowledge, delivery planning, organisation and people, review and improvement. Key findings are: a formalised approach to Maintenance Requirements Analysis (MRA) is required; industry records need improving, particularly failure and reliability data to facilitate adoption of Failure Modes Effects and Criticality Analysis (FMECA) processes; there is opportunity for more automated condition monitoring equipment; resource planning could be improved; competencies need to be maintained to address industry change; and there remains scope to improve efficiency and quality in delivery of works, for example through adopting Lean and Six-Sigma approaches.

8.304 The study identifies that adoption of a risk based approach to inspection and maintenance has led to efficiencies of between 15 and 30% in comparator organisations. It assesses the scale of opportunities remaining for CP5 by asset

category, given the plans that Network Rail has in place. Further efficiencies are thought to be available in CP5 as follows: 10% for signalling assets, 7% for electrical power and plant assets, 10% for telecoms assets. No further efficiencies are identified for track beyond those plans already in place. No further efficiencies are identified for civil structures given the extensive work already underway to improve inspections (and civils asset management more widely) in CP4 and assumed to form part of Network Rail's SBP.

Maintenance and renewal efficiency – previous studies

8.305 In addition to studies which have been conducted as part of the PR13 process there is an extensive body of work which has been carried out previously. This includes consultant reports produced for the Rail Value for Money study, for PR08 and for other efficiency analyses. Many of the opportunities identified by these studies remain relevant; some are still to be addressed, some have been partially addressed and some have been fully implemented. We have carried out a systematic review of all PR08 and RVfM study documents to identify and catalogue all efficiency opportunities. We have used engineering consultants, RailKonsult, to assess the extent to which the opportunities identified will remain valid at the end of CP4, to quantify the remaining efficiency and to opine whether the full remaining efficiency could be achieved in CP5.

Maintenance and renewal efficiency – Network Rail's evidence

8.306 Network Rail has carried out benchmarking in support of its efficiency projections for CP5. We, supported by the independent reporter Arup, have audited this benchmarking. Our findings are set out by main asset category in the section that follows. The key overarching findings are set out here.

8.307 Network Rail's programme of benchmarking work has been more extensive than it has ever carried out before. It includes internal and external benchmarking, international (including outside Europe) benchmarking, and, in some cases, benchmarking against other industries. The company has devoted a large resource to the programme and it has produced useful results. We consider that the benchmarking carried out represents a good start, and the efficiency opportunities identified are useful benchmarks. In some cases the data produced are less comprehensive than would be ideal. Network Rail has had difficulty in finding a suitable number of comparators that are willing to fully engage and provide quantified

data within the timeframes of its PR13 programme. It has focused on understanding 'better practice' rather than understanding the quantum of efficiency that could be realised in CP5.

8.308 Network Rail has recognised that international benchmarking requires a long-term engagement plan and that it should become a 'business-as-usual' activity. We support the continued development of this work. As the benchmarking programme continues into CP5 we expect it to identify further better practices and efficiency opportunities that can be realised during the control period and beyond.

8.309 The reporter's review highlights that a significant increase in pre-efficient baseline expenditure can lead to efficiency savings being cancelled out over the long-term. We recognise this and have challenged Network Rail's pre-efficient costs rigorously. Where the company has not provided sufficient evidence to support its pre-efficient expenditure forecasts we have made adjustments.

Maintenance and renewal efficiency – overall view

Our bottom-up efficiency analysis

8.310 Our overall view of the efficiency available in CP5 is informed by the expert views given in the full range of studies described. We have carried out a comprehensive review of all efficiency evidence highlighted by these studies and taken a view on the likely efficiency opportunity which will remain at the end of CP4. In doing this we have considered the extent to which Network Rail has already addressed the issue identified, or has plans in place to address it by the end of CP4.

8.311 In evaluating the efficiencies available to Network Rail in CP5 we have considered the full efficiency over and above that achieved in CP4. This includes the efficiencies which we believe will be gained through the implementation of the proposed CP5 policies, referred to as "embedded efficiencies" since they are embedded in the CP5 policies. In its SBP Network Rail set out its pre-efficient plans on the basis of CP4 exit unit costs and application of CP5 policies.

8.312 The full body of evidence that we have catalogued has been mapped to associated costs in Network Rail's SBP. This results in our view of efficiency by route for maintenance and renewal. In developing our quantified view of efficiencies from the underlying evidence we have used the judgement of the ORR's expert asset engineers and safety professionals. This judgement is informed by Network Rail's plans, the views of the independent reporters, and the views of numerous industry

experts as expressed in the studies reviewed. Our judgement is intended to be taken "in-the-round".

8.313 All efficiencies identified have been reviewed to identify possible safety implications. We do not consider that any of the efficiencies identified need result in any detrimental impact on safety; many of them have the potential to deliver a substantially safer railway.

8.314 Many source documents suggest a range of plausible efficiencies from the initiatives identified. We have taken a conservative view, recognising that there may be overlaps in evidence and efficiencies. We have given consideration to the deliverability of identified efficiencies within CP5.

Our efficiency overlays

8.315 The efficiency overlays that we have applied are the result of weighting our bottom-up developed efficiencies and Network Rail's efficiencies. The weighting we have applied is based on our view of the robustness of Network Rail's benchmarking and efficiency work, and for renewals it varies by asset category. This is informed by the independent reporter's review of the company's benchmarking and efficiency evidence.

Table 8.25: Our assessment of Network Rail's benchmarking and efficiency and our applied weightings

Asset	Assessment of Network Rail's benchmarking and efficiency	Weighting applied to Network Rail's efficiency analysis	Weighting applied to ORR's efficiency analysis
Renewals			
Track	Fair	50%	50%
Signalling	Good	75%	25%
Civils	Some significant limitations	25%	75%
Buildings	Fair	50%	50%
E&P	Good	75%	25%
Telecoms	Some significant limitations	25%	75%

8.316 For maintenance the reporter's review of benchmarking and efficiency found a range of issues and we have reflected this in developing our view. Further details of efficiency are given by asset category later in the chapter.

8.317 Finally, we have reviewed cross-cutting areas of potential efficiency which have not been covered by our bottom-up analysis or in the efficiency evidence which Network Rail has set out. These include inflation management and occupational health management as discussed in chapter 4. Our review of these concludes that a further 1.12% efficiency can be gained by the final year of CP5.

8.318 We conclude that maintenance efficiencies of 16.5% and that renewals efficiencies of 20.1% are available by the final year of CP5.

International top-down benchmarking

8.319 We have carried out international top-down benchmarking as described in detail at the end of the chapter. The results of the top-down benchmarking, whilst not fully directly comparable, give us higher confidence that the efficiency overlays which we have developed using bottom-up techniques, and which we have applied to develop our view of efficient costs, apply an appropriate level of challenge.

Maintenance and renewals assessment

8.320 We set out our assessment of maintenance and renewals below. Because Network Rail took different approaches in producing its maintenance and renewals plans we have set out our assessment separately.

Maintenance assessment

Pre-efficient

8.321 Network Rail's maintenance policy and strategy is discussed in various parts of the SBP submission, including in the asset policies, the "Infrastructure maintenance strategy" document, the "Optimising maintenance regimes" document and in its maintenance efficiency business cases. The documents set out, at a high level, Network Rail's proposed approach to maintaining its assets.

8.322 Network Rail has carried out central modelling of maintenance activities required based on its asset portfolio and interpretation of the high level requirements set out in the asset policies. Maintenance expenditure has then been calculated for direct activities (i.e. maintenance work carried out on infrastructure assets) by multiplying

volumes of activity by maintenance unit costs. Indirect costs (such as route based maintenance management teams) have been modelled separately. Network Rail provided the outputs of its central modelling to the routes.

8.323 Routes separately produced maintenance expenditure plans on the basis of their projected headcount requirements. These plans were variable in the extent to which they took account of route specific factors. There was evidence of routes taking account of major infrastructure changes such as enhancement related new electrification assets, but little evidence of changes in response to new asset policies, except in their assumed efficiency overlays.

8.324 Network Rail did not submit maintenance volumes with its SBP. Subsequently we asked for a breakdown of maintenance volumes to be provided and these have been submitted for CP5 for some maintenance work types relating to track, signalling, and electrification and power.

8.325 We consider that the links between Network Rail's proposed approach to maintenance, its submitted volumes and its planned maintenance expenditure are weak. Network Rail's submitted plans are resource based. The templates used in the financial modelling system to collate the routes' costs did not support a volumes based approach. As a result Network Rail has been unable to provide assurance that its maintenance costs represent the costs of the actual volume of maintenance work required in CP5.

8.326 These limitations in Network Rail's maintenance planning lead to uncertainty in the maintenance plans put forward. However, we have not identified an overall bias in the approach taken in building the pre-efficient plans and have therefore not made adjustments for this uncertainty (with the exception of an adjustment for reactive maintenance costs).

Maintenance efficiency

8.327 Network Rail has developed a set of maintenance efficiency documents which describe the efficiency initiatives identified, as informed by its programme of benchmarking. Examples of the key areas identified are: risk-based maintenance, improved working practices, savings in the indirect maintenance costs, better asset information (and therefore improved targeting of work and improved response to infrastructure faults), more mechanisation, further roll-out of intelligent infrastructure,

multi-skilling, standardisation, improved contracting strategy and further recycling of materials. Network Rail's identified central efficiencies were estimated to deliver £194m of efficiency savings in CP5.

8.328 Some local efficiencies have been developed by the routes which are estimated to deliver £140m of efficiency savings in CP5. These largely relate to improved planning processes and to consolidation of route delivery units to generate efficiencies in indirect costs.

8.329 In addition to central and route initiatives Network Rail has assumed that further, as yet unidentified, route initiatives will generate £140m further savings in CP5.

8.330 The independent reporter, Arup, has audited the benchmarking and efficiency analysis carried out for maintenance activities. In summary, it considers that the approach taken to external benchmarking and the evidence presented has some limitations, and that the approach to internal benchmarking and evidence presented is very poor. Arup found that central efficiency initiatives were not disaggregated by route and there was limited evidence of routes challenging central efficiency proposals. Due to the issues identified by Arup we have used our view of available maintenance efficiencies in developing our assessed efficient expenditure.

8.331 We have conducted our own analysis of the maintenance efficiencies that might be available during CP5. The key difference between our assessed maintenance efficiency and Network Rail's submission is that we assume a different profile, with lower efficiencies to be delivered in the earlier years of CP5 and higher efficiencies to be delivered in the later years. This assumption reflects our concerns over the delivery of efficiencies in CP4 when Network Rail reduced staffing levels before fully embedding more efficient ways of working. Our findings are given by asset below.

Track

8.332 We consider that the most significant track maintenance efficiencies are available from improved asset management systems, further automation of inspection, improved possession management, alliances and improved ballast distribution systems. Our assessed total efficiency in CP5 is comparable to Network Rail's but we have assumed a different profile, resulting in higher efficiency in the final year of CP5.

Table 8.26: ORR assessed costs, track maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	434	439	439	438	435	2185
Efficiency	-	3.6%	3.6%	3.6%	3.7%	3.7%	17.0%
Post-efficient expenditure	420	418	408	393	377	361	1958

Signalling

8.333 We consider that the key areas of efficiency for signalling maintenance are remote condition monitoring, recycling of materials, risk based maintenance, procurement policy and improved asset management systems. Our assessed total efficiency for CP5 is comparable to Network Rail's but, as with track, we have assumed a different profile.

Table 8.27: ORR assessed costs, signalling maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	158	158	158	159	160	793
Efficiency	-	2.8%	2.8%	2.9%	3.0%	3.1%	13.7%
Post-efficient expenditure	158	153	149	145	141	138	728

Civils and buildings

8.334 A significant proportion of submitted costs for civils and buildings maintenance work appears to arise from Network Rail's own review and administrative activities, including possessions management. Our assessment of civils maintenance efficiency assumes a small amount of efficiency from these activities and from improved supply chain management.

Table 8.28: ORR assessed costs, civils and buildings maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	82	82	82	81	82	408
Efficiency	-	0.6%	0.6%	0.6%	0.7%	0.7%	3.1%
Post-efficient expenditure	35	81	81	80	79	79	400

Electrification and power

8.335 We have identified significant electrical power and fixed plant maintenance efficiencies from improved processes for inspection of overhead lines, improved procurement policy and improved asset management systems. We have assumed a profile delivering higher efficiencies in the final year of CP5 than that assumed by Network Rail.

Table 8.29: ORR assessed costs, electrical power and fixed plant maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	94	101	104	105	108	512
Efficiency	-	4.4%	4.5%	4.6%	4.7%	4.8%	20.9%
Post-efficient expenditure	73	90	92	90	87	86	445

Telecoms

8.336 The key areas of efficiency identified by our analysis are improved procurement policy, and improved asset management systems, with greater efficiency than forecast by Network Rail being delivered by the final year of CP5.

Table 8.30: ORR assessed costs, telecoms maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Pre-efficient expenditure	-	22	22	21	21	21	107
Efficiency	-	4.4%	3.6%	3.7%	3.8%	4.0%	18.1%
Post-efficient expenditure	21	21	20	19	18	18	95

Other maintenance costs

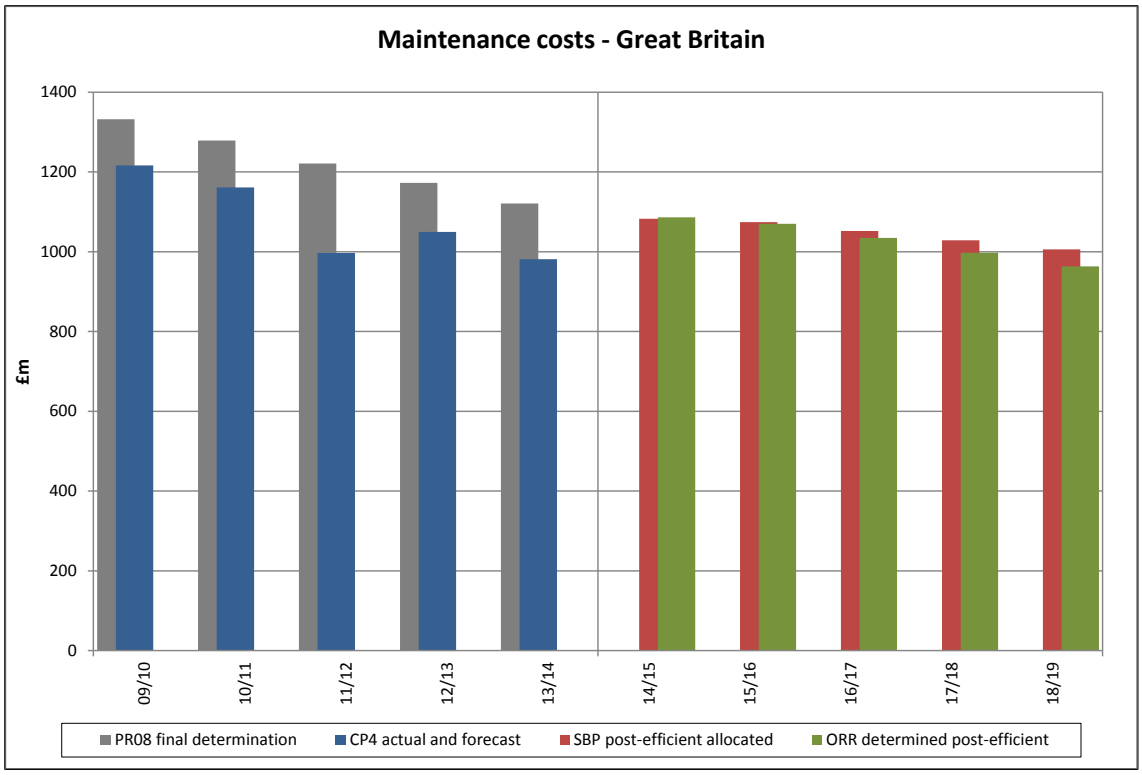
8.337 For other maintenance costs we have found a higher efficiency potential compared to Network Rail's assumptions. These are primarily based on improved procurement policy, improved asset management systems which will enable better planning, and other maintenance overhead efficiencies.

Maintenance findings overview

8.338 Our assessed efficient maintenance expenditure is illustrated below. We have reduced Network Rail's proposed expenditure by £92m.[138]

[138] The increase in expenditure from CP4 to CP5 is due to an accounting change which reclassifies some small scale works, referred to as 'reactive maintenance', as maintenance instead of renewal.

Figure 8.9: Our assessment of efficient expenditure for maintenance



Renewals assessment

8.339 We set out our renewals assessment by asset below, including review of underlying asset data, unit costs, policy and modelling, efficiency and summary of our findings.

Track assessment

Asset data

8.340 Track asset data quality is reasonable but requires some improvement: plain line data and S&C data are graded B3. Network Rail has a good understanding of track service lives.

Unit costs

8.341 Track unit costs are of good quality. Network Rail's plans are substantially based on the application of unit costs which are well understood and developed using appropriate methodologies. The development of the unit costs includes uplift for risk and contingency. The application of these overlays at a disaggregated level introduces high potential for overestimation. For this reason we have applied a 2% adjustment to pre-efficient costs.

Policy and modelling

8.342 The CP5 track policy is one of the more mature asset policies. We consider the assessment of asset criticality based on 5 bandings relating to average delay costs to be an improvement on the similar four quadrant methodology currently in use. It results in a more targeted and risk-based policy for maintenance and renewals. The policy differentiates interventions based on criticality, for example, requiring more refurbishment to be carried out on lower criticality routes. The move towards a more targeted renewal approach is well supported by the whole life cost modelling that has been carried out.

8.343 Network Rail has made good progress in demonstrating that the track policy is both robust and sustainable. It has forecast measures of condition (used life) and asset performance (track geometry and serious rail defects) to CP11 which indicate that the policy is not allowing the asset base to deteriorate in the long-term. Performance is forecast to increase to the end of CP6 and then to be maintained until the end of CP11.

8.344 The plain line track whole life cost modelling is considered good. It is based on the best understanding of asset degradation of all the asset categories, and on robust failure modes, effects and criticality analysis. S&C degradation has not been fully validated and currently relies on engineering judgement. Network Rail is currently carrying out work to improve the modelling by understanding better the deterioration of S&C.

8.345 We consider that the track asset policy has, in the round, met our criteria for robustness and sustainability. Network Rail has demonstrated some significant minimum whole life cost optimisation but there are opportunities for further optimisation. For example, there is uncertainty over the assumed service life increase for refurbished S&C.

8.346 Renewal of track plain line and S&C has been modelled by applying service life assumptions to the current and forecast asset base. The engineering rules applied in the model were found to be consistent with the track policy. Model inputs were found to be accurate with the exception of a minor inconsistency in traffic data and a variation in refurbishment costs of up to 7%. No computational errors were identified and outputs were accurately included in the SBP data tables and showed reasonable alignment with route based plans.

8.347 Network Rail has included expenditure within its plans associated with the acceleration of track renewals from future control periods. This is expenditure which will, in the long-term, deliver work more efficiently. Accelerated track renewals are proposed where future access will be more constrained (for example due to the completion of Crossrail) or where enhancements are leading to increased tonnage. We have reviewed Network Rail's proposals for accelerated track renewals and consider that they are well evidenced. The proposed volume of maintenance and renewal work is in line with our expectations when considering the accelerated renewals.

Efficiency

8.348 We consider Network Rail's external benchmarking for track to be relatively good. It has conducted a programme of site visits to external comparators to observe working practices and identify better practices which might be adopted on its network. Its track benchmarking has included visits to Sweden, Switzerland, Italy, France and Spain. Information gathered is both qualitative, for example noted differences in work activities, and quantitative, including a high level comparison of unit costs between Network Rail and four European peers. In addition to its benchmarking work, the company has presented its models for future delivery of plain line and S&C renewals. These models are well developed with clear alignment between the benchmarking work and efficiency measures within the models. Efficiency measures include reducing the size of gangs, increased multi-skilling of staff, greater use of mid-week possessions and a new contracting strategy. There is moderately good alignment between the proposed efficiencies presented in the track efficiency business cases and the efficiencies which appear in the SBP.

8.349 Our review of efficiency finds similar best practice opportunities to those identified by Network Rail but quantifies them to find greater overall cost efficiencies. Key areas of potential efficiency are further automation of track inspection, improved asset management systems, improved supply chain management and improved management of possessions. We have applied 50% weighting to our analysis and 50% to Network Rail's which reflects our view of the robustness and completeness of the track benchmarking and efficiency work conducted by Network Rail.

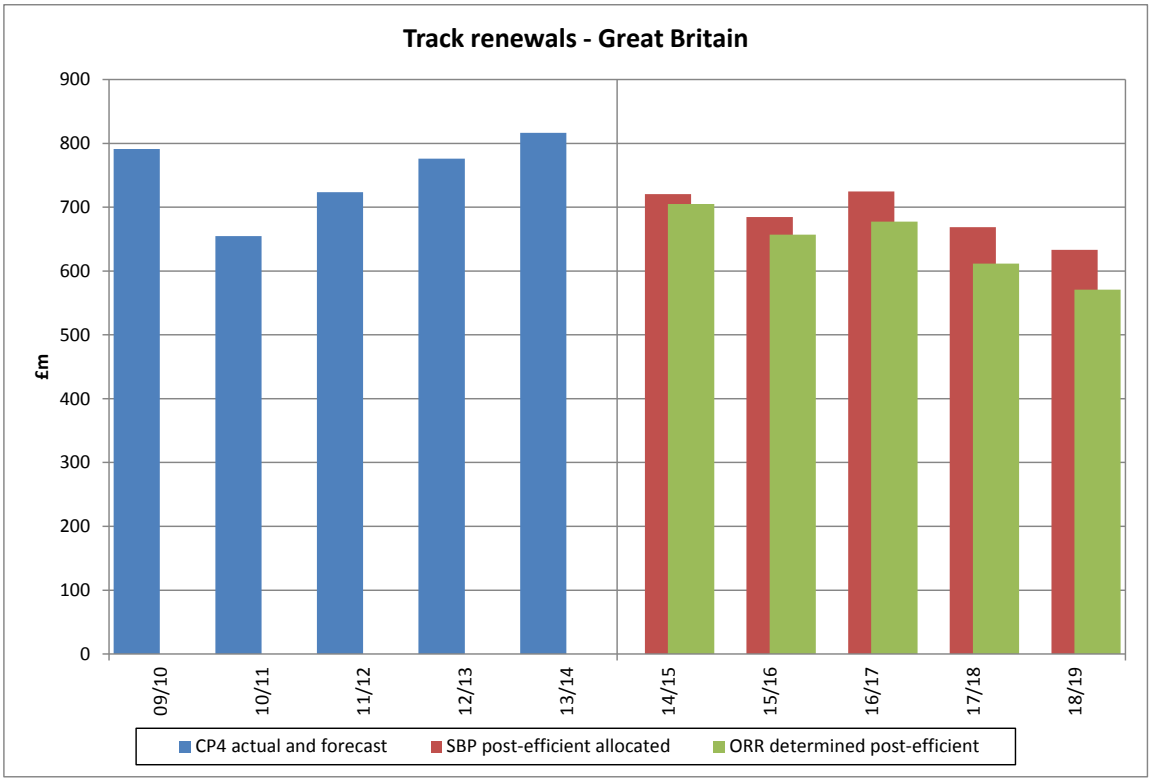
Findings

8.350 Our assessment of the level of track (including off-track) expenditure required during CP5 is shown in Table 8.31and illustrated in Figure 8.10 below.

Table 8.31: ORR assessed costs, track renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	756	745	808	770	756	-	3836
Efficiency	-	6.8%	5.4%	5.0%	5.2%	4.9%	-	24.5%
Post-efficient expenditure	816	705	657	677	612	571	3762	3221

Figure 8.10: Our assessment of efficient expenditure for track renewals



8.351 In total we have reduced Network Rail's planned renewals expenditure on track and off-track by £210m.

Off-track assessment

8.352 We welcome the development of an asset policy for off-track assets and the recognition of the importance of off-track assets in contributing to the efficient delivery of network safety and performance.

Asset data

8.353 Network Rail has recently taken steps to increase significantly its knowledge of its off-track assets. Its information relating to boundaries has been improved by routine data collection during boundary inspections. Vegetation knowledge has been improved through the National Lineside Tree Survey, completed in March 2011. Improved asset knowledge has enabled better planning of the volume of maintenance and renewal works required.

Policy and modelling

8.354 The off-track policy is relatively immature since it is new and untested. It promotes the move from a reactive approach to a more proactive management of boundaries and vegetation as the most cost effective way of managing the assets. The policy results in a planned large increase in expenditure relative to CP4. This expenditure is forecast to improve asset condition to a level which will be sustained from the end of CP5 for England & Wales and from the end of CP6 for Scotland.

8.355 Network Rail has more work to do to demonstrate the efficiency of the policy and to understand the optimum interventions and strategy. It has not yet developed a model for optimising long-term asset management costs. We welcome the move towards a more proactive approach to the management of off-track assets and the safety and performance benefits that this will bring. We believe more can be done to investigate the most appropriate and cost effective ways of managing boundaries and consider that the proposed volumes of work require more substantiation.

8.356 We consider that the proposed policy is likely to be robust and sustainable but the effect of the new policy will have to be monitored closely. The policy is not demonstrated to be minimum whole life cost.

8.357 Network Rail's plans do not specify the volumes of vegetation clearance that will be delivered. The policy states that all fences in 'very poor' condition are to be renewed and all 'poor' condition fences are to be repaired. The plans do not include present

and forecast condition measures to show the scale of improvement which will be delivered.

8.358 Modelling is not as refined as for the track asset but it uses reasonably accurate actual data from fencing and vegetation surveys. The off-track model for fencing was found to have inconsistencies with the asset policy which leads to uncertainty over its outputs. Unit rates used were found to be rudimentary but consistent with the off-track policy. No computational errors were identified.

8.359 Our view, supported by the independent reporter, is that the overall costs which are included in the plan are above the levels which are necessary to deliver the policy requirements. For these reasons we have reduced Network Rail's pre-efficient plans for management of boundaries by 25%.

Efficiency

8.360 Our analysis of off-track efficiency has found significant opportunities from increased mechanisation of vegetation clearance, improved asset management and information systems and improved supply chain management. We have applied 50% weighting to our analysis and 50% to Network Rail's which reflects our view of the robustness and completeness of the off-track benchmarking and efficiency work conducted by Network Rail. In total our assessed expenditure for off-track renewals gives Network Rail £88m more than is forecast to be spent in CP4.

Signalling assessment

Asset data

8.361 Network Rail uses a Signalling Infrastructure Condition Assessment (SICA) tool to prioritise signalling maintenance and renewal works. SICA and its use were audited by the asset management independent reporter in 2011. The reporter found SICA to be fit for the purpose which it was designed for: to prioritise logically the short- to mid-term renewals workbank. Useful remaining lives generated by SICA are underestimated and are not accurate for use in strategic planning. SICA is not a suitable tool for ensuring that signalling assets are managed sustainably to achieve minimum whole life cost. The independent reporter, Arup, graded signalling asset data quality A3, reflecting good practice data governance, but some deficiencies in terms of data accuracy and completeness.

Unit costs

8.362 The independent reporter's audit of signalling unit costs has found some limitations in the approach adopted including the adjustment of new framework rates to reflect historical levels of cost performance. As with all asset types Network Rail has not provided sufficient evidence to demonstrate strategic oversight in the estimation of risk allowances. It has estimated risk at a unit cost level rather than a programme level which has high potential to overestimate risk allowances. The reporter has also found that uplifts have been made to unit costs based on the risk and management costs seen in CP4. The new signalling contracts have transferred some risk to the supply chain and it is not clear that this has been reflected in the CP5 unit costs. For these reasons we have applied a 3% reduction to Network Rail's pre-efficient costs.

Policy and modelling

8.363 The CP5 policy for signalling sets out a well justified approach to managing the maintenance and renewal of signalling assets, taking account of the major programme of works required for both NOS and the staged further introduction of ERTMS. Due to the national and long-term nature of these programmes the forecasts of signalling maintenance and renewal works are more dependent on centrally developed long-term workbanks than is the case for other assets. The asset policy includes appropriate statements on the prioritisation, advancement and deferral of work to ensure that programmes are aligned.

8.364 The policy requires the use of partial and targeted renewals instead of full renewal where possible and this is considered an appropriate, efficient approach where no changes are needed in preparation for ERTMS.

8.365 The policy of moving from conventional signalling to ERTMS is considered sound. The business case for the national application of ERTMS was established and reviewed approximately four years ago. This demonstrated that there was a long-term whole life, whole industry benefit to implementing ERTMS, through the reduction of lineside assets, safety benefits and capacity improvements. The plans for CP5 show significant costs, including development costs, to support that long-term benefit.

8.366 The policy to move to more centralised signalling control has been assessed through review of the business case as discussed in chapter 7 and is considered to be appropriate. This programme of work results in a large volume of signalling renewal in CP5 but this is justified by the future benefits in operational costs.

8.367 The volume of signalling renewals in CP5 has been assessed. The management of signalling renewals is a well-managed process resulting in volumes of renewal which have a high degree of credibility. The signalling asset policy is considered robust to deliver outputs in CP5.

8.368 We have reviewed the sustainability of the signalling asset policy by challenging the modelling of long-term outputs in its signalling strategic planning model. The renewal of signalling asset would normally be managed to maintain a steady level of asset condition measured nationally. In CP5 the plan to accelerate some renewals for the benefit of NOS should result in a small improvement in overall asset condition. We consider that the CP5 signalling asset policy is likely to deliver an asset base of stable condition in the long-term, while delivering the major programmes of work needed by the industry.

8.369 The whole life cost modelling that supports the signalling asset policy has considered an appropriate mix of asset interventions. We have some concern that the degradation modelling may be conservative. The use of SICA in the strategic planning model may result in a slight bias towards over-forecasting in the long-term. However, the development of long-term workbanks, and the alignment of key national programmes of work is excellent and gives confidence that the plan is optimised on a whole life cost basis.

8.370 The signalling model takes the bottom-up developed signalling workbanks as an input. The model was found to be consistent with policy. Some inconsistencies in unit costs for specific signalling work types were identified. No specific, consistent and material issues were found with computational accuracy in modelling costs and volumes for CP5.

Efficiency

8.371 In its SBP Network Rail claimed that there were £380m of embedded efficiencies being delivered by its CP5 signalling policy. The actual efficiencies being generated by a change of asset policy are difficult to determine (since a change in policy is likely to lead to changes in expenditure in all future control periods). However, our review finds that the level of embedded efficiencies for signalling is likely to be overstated due to flaws in the calculation methodology. We have assumed that signalling embedded efficiencies are £190m.

8.372 Our assessment of additional efficiency has found some significant opportunities remain from further adoption of modular signalling, plug-and-play technology, improved asset management systems and from adopting best practice supply chain management. The analysis results in a higher level of efficiency than proposed by Network Rail.

8.373 The independent reporter's audit of Network Rail's benchmarking and efficiency for signalling renewals has found the approach adopted to be reasonably good. In particular it has found the internal and external benchmarking that has been carried out to be sound. Network Rail has engaged with its suppliers in developing signalling framework contracts which reflect commitment to delivering the efficiencies. Given the relative certainty in signalling efficiencies from the supply chain we have applied 75% weighting to Network Rail's efficiency plans and 25% to our analysis.

Routes

8.374 Signalling plans are based on long-term workbanks which have been developed centrally to ensure that they are aligned with the ETCS and NOS programmes. Routes are bought in to the central plans and these are reflected in route plans.

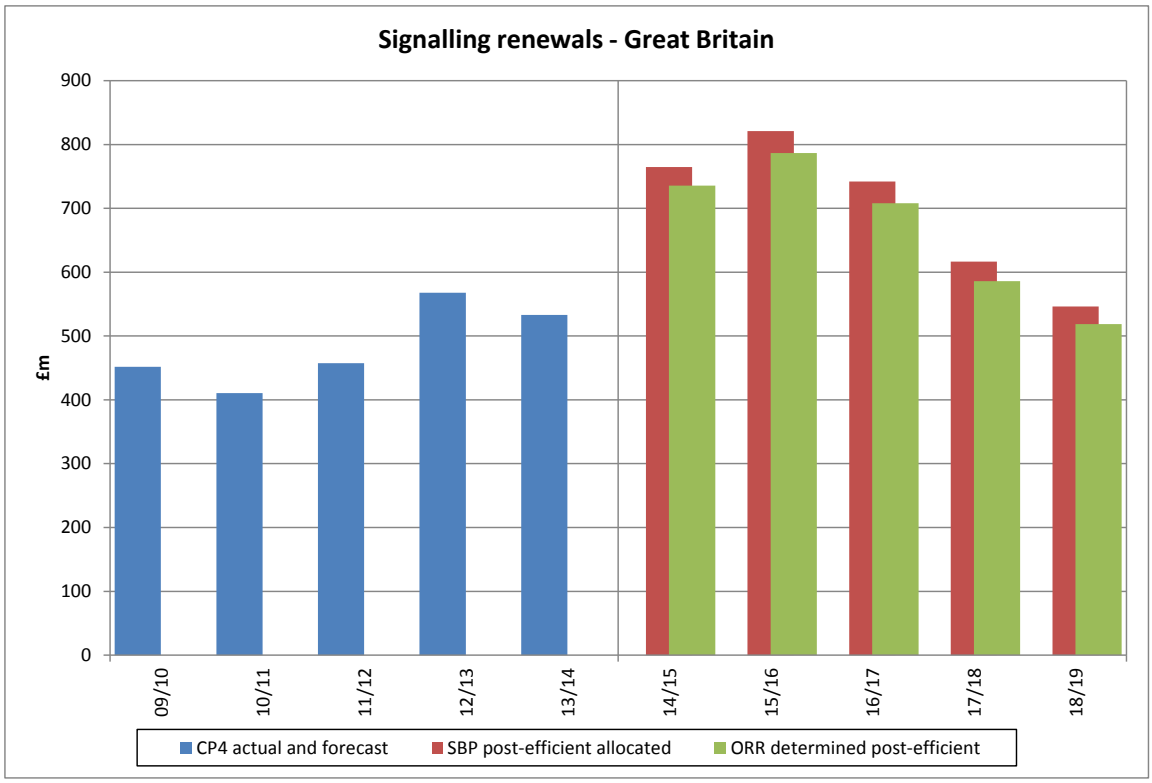
Findings

8.375 Our assessed efficient expenditure for signalling renewals is illustrated below.

Table 8.32: ORR assessed costs, signalling renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	808	903	856	742	682	-	3990
Efficiency	-	9.0%	4.3%	5.1%	4.5%	3.7%	-	24.0%
Post-efficient expenditure	533	736	787	708	586	519	2421	3335

Figure 8.11: Our assessment of efficient expenditure for signalling renewals



8.376 Our assessment of Network Rail's plans supports the large increase in expenditure from CP4 to CP5, which is driven by the asset policy and its consideration of well justified national programmes of work: NOS and ERTMS.

8.377 In total we have reduced Network Rail's planned renewals expenditure on signalling by £155m, but our assessed expenditure is £914m greater than planned expenditure in CP4.

Treatment of ERTMS train fitment costs

8.378 In its SBP, Network Rail treated costs associated with fitting ERTMS equipment on trains as renewal expenditure. Our draft determination uses the same categorisation (i.e. these costs are included in Table 8.32 and Figure 8.11). However, because the costs of ERTMS train fitment are new they are uncertain and levels of risk are high. For final determination we therefore propose to treat ERTMS train fitment costs as an enhancement ring-fenced fund as discussed in chapter 9.

Level crossings assessment

Asset data

8.379 The independent reporter graded level crossings asset data quality A2, reflecting good practice data governance, but with some shortcomings in the accuracy or completeness of data.

Unit costs

8.380 Unit costs for level crossings are produced in a similar manner to conventional signalling equipment. However, our review suggests that they include high levels of additional overlays which have not been fully justified and that they are high compared to other control periods. We have therefore applied a 7.5% reduction to level crossings pre-efficient costs.

Policy and modelling

8.381 For CP5 the volume of level crossing activity is a combination of standalone crossing renewals, crossing renewals associated with signalling renewals and safety improvement upgrades.

8.382 Level crossing renewals and maintenance are managed through the track and signalling asset policies. Network Rail plans to introduce greater coordination of level crossing activities. Key to this is the introduction of level crossing managers who will oversee activities at their designated crossings.

8.383 A criticism in the past has been that signalling renewals have ignored level crossings in the area affected, hence missing opportunities to modernise or upgrade crossings efficiently as part of a larger scheme. Network Rail now indicates a clear intent to improve on this issue in CP5.

8.384 Discussions with Network Rail also indicate a greater understanding of the need to assess risk at level crossings before determining what action is appropriate. We welcome this and it should result in well-chosen solutions for level crossing renewal and/or upgrade.

8.385 Many manual level crossings will receive attention in CP5 as they will need to be modified to obstacle detection operation. This is likely to result in a small improvement in overall asset condition.

Efficiency

8.386 Technology developments that offer the potential for efficiencies and safety improvements are dependent on a small group of engineers for their success. Some of these projects seem to be very slow in development which may be a result of an imbalance of demand and resources.

Civils assessment

Asset data

8.387 Civils structures asset data are of poor quality. Whilst Network Rail now has reasonable data governance processes in place there is very significant inaccuracy in the records held. This leads to high uncertainty in the planned works for CP5. The independent reporter graded civils asset data quality B5.

8.388 Asset data relating to earthworks are kept in an online earthworks condition database. Network Rail has recently improved its asset knowledge and is undertaking a number of improvements and corrections to this database. The majority of earthworks assets have had at least one examination. Condition data for earthworks are captured using 'hazard' indices which categorise assets as serviceable, marginal, poor or top poor. Coverage of the asset base is good and data are considered to have low uncertainty.

Unit costs

8.389 Civils unit costs are based on a statistical analysis of historical project cost data, drawn from the Cost Analysis Framework (CAF).

8.390 Unit costs are used to develop just over half of the CP5 planned expenditure for overbridges and underbridges, 87% of earthworks expenditure and less than half of the remaining expenditure. The proportion of civils planned expenditure based on non-unitised costs is relatively high and these have a greater level of uncertainty.

8.391 The independent reporter has audited Network Rail's development of its civils unit costs and found a range of issues which introduce uncertainty or bias:

(a) there is significant uncertainty in the method of cost estimation for overbridges and underbridges and the level of preliminary costs within these items is disproportionately high for civil engineering works of this nature;

(b) there is an error in the application of further overlays for preliminary works and management costs which is likely to lead to an overestimation of costs of approximately 10 to 20%;

(c) there is potential for the overestimation of risk and contingency in the unit costs due to overlays being applied at a disaggregated level;

(d) there is inconsistency in the inflation indices used to uplift historical costs for different civils asset categories;

(e) further evidence is required that the historical mix of work is representative of the mix of work in CP5 as this affects unit costs; and

(f) there is very high uncertainty in relation to minor works cost projections.

8.392 For these reasons we have reduced Network Rail's pre-efficient cost forecasts. We have applied a 5% reduction in the first two years on the basis that a greater proportion of expenditure is supported by project estimates, and a 10% reduction for the remaining years where forecasts are more reliant on unit costs.

Policy and modelling

8.393 Network Rail has completely rewritten its civil structures and earthworks asset policies in response to the recommendations resulting from the reporter's review of civils asset management (as discussed previously). We, and the independent reporter Arup, have assessed the new policies and found them to be a very significant improvement on those currently being implemented and past practice. Previous policies were ambiguous, did not set clear intervention triggers and requirements, and were open to significant interpretation, leaving considerable uncertainty over the required level of work to maintain a safe and sustainable asset base.

8.394 The structures policy sets out the triggers for intervention and clear rules for the nature of the work required. The policy has been supported by simpler and clearer 'policy on a page' documents. Network Rail has produced a whole life cost model for some of the structures assets. The model is a sophisticated tool which has been used to inform the optimisation of interventions. The model has been audited and found to be computationally sound. However, the whole life cost modelling is limited by the quality of its unit cost and asset degradation inputs, leading to outputs which are considered to have moderately high uncertainty.

8.395 The earthworks policy aims to reduce the earthworks related delay minutes (largely driven by embankments) and to reduce the number of asset failures (mainly driven by cuttings). It has been developed using a decision support tool called SCAnNeR. The model has been used to assess intervention options which range from maintenance to

full renewal. We have reviewed the model and its application and consider it to be sound. However, the company has further work to do in developing its understanding of degradation and risk prioritisation which may result in further optimisation of the policy. The policy proposes a logical approach to asset interventions on the basis of route criticality and asset condition, for example recognising that cuttings generally represent a higher safety risk than embankments. However the policy focuses primarily on maintaining and refurbishing earthworks assets rather than carrying out full renewal and this raises issues as discussed in chapter 11. Network Rail has recognized the importance of drainage and its contribution to addressing the root cause of earthworks failures. The prioritisation of drainage work for CP5 is considered appropriate to manage the asset.

8.396 Network Rail is currently analysing the large number (approximately 180) of earthworks failures which occurred in 2012-13 to see if amendments are required to its earthworks standards or policies. This may have an implication for the CP5 workbank.

8.397 As with other asset categories Network Rail has carried out both central modelling and route based development of civils workbanks to forecast the effect of implementing the new policies. The central model for civils structures is called CECOST. It uses similar principles to the CECASE model submitted in support of the company's PR08 SBP. The CECOST modelling and outputs were being developed in short timescales in the run-up to the submission of the SBP. The model was not available for detailed scrutiny as part of our progressive assurance work prior to the SBP submission. Presentation of the model and its outputs has been insufficient to provide assurance that it is producing a robust forecast of work required by the asset policy. Earthworks modelling has been carried out using SCAnNeR. The model has been reviewed based on an engineering assessment of its inputs and outputs and no material issues were found.

8.398 Effectiveness of the new structures and earthworks policies is critically dependent on how well new practice is embedded in the devolved routes and this will be the subject of further review in 2013.The embedment process is in its early stages and is expected to continue throughout CP5. The plans for CP5 include the expenditure associated with these programmes during the period.

Efficiency

8.399 Network Rail has forecast civil renewals efficiency of 13.8% during CP5. Our analysis finds potential for greater efficiency of 19% from adopting best practice asset management for these assets. For example, there is potential for efficiency from better packaging of civils renewals works, improved supply chain management and improved data management, availability and analysis. There will also be efficiencies available due to the high volumes of work required over the next two control periods. Our audit of Network Rail's benchmarking and efficiency work has found that there are some significant limitations to the approach adopted and evidence base presented. Whilst the company's external benchmarking was considered relatively good, the audit found significant limitations in plans at operating route level and a lack of internal challenge applied. For the first two years of the control period our efficiency analysis finds very similar levels of efficiency to Network Rail's plans. We have accepted Network Rail's efficiencies for these two years. For the remaining three years, due to the weaknesses identified in Network Rail's approach we have applied 25% weighting to its analysis and 75% to ours.

Routes

8.400 Network Rail's routes have, independently, produced workbanks to align with the structures and earthworks asset policies. The route plans developed have been of varying quality. The most complete workbanks are based on a full survey of civil assets and assessment of the most appropriate work required based on on-site condition. Some routes appear to have built workbanks based on relatively poor information and a less complete understanding of the application of the new policy.

8.401 Network Rail has not fully understood the drivers of differences between its route plans and central modelling. This has resulted in a plan which uses the outputs of central modelling for forecasting of some of its detailed costs and route based plans for others and leads to potential for inconsistencies.

Findings

8.402 Network Rail's derivation of its civils plans is not clear. We have held a series of meetings with the company to gain more clarity. These have led to submission of corrections to the original SBP data, submissions of new data and production of further clarification documents. We have concerns about the process for development of the civils plans and have not been assured that the costs and volumes presented

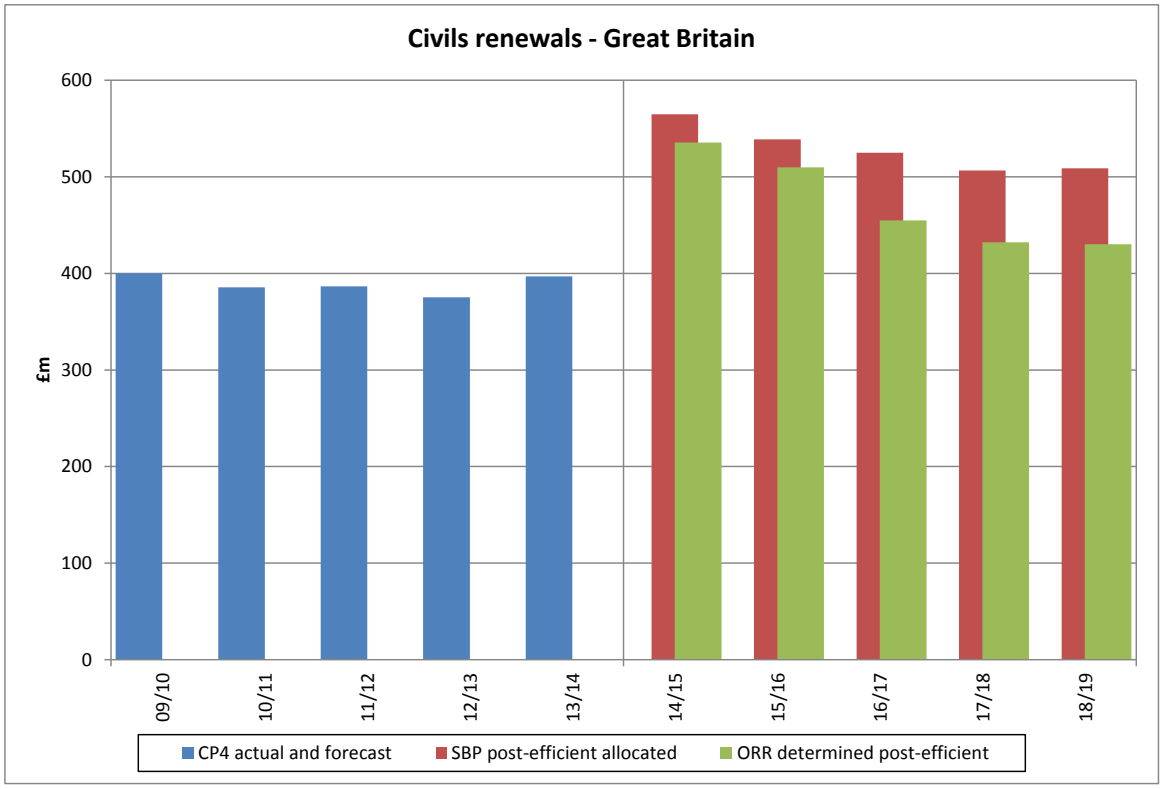
are robust, sustainable and efficient. We consider that the proposed costs and volumes for delivery of structures and earthworks asset policies in CP5 and beyond are highly uncertain. Network Rail has further work to do to fully understand the required levels of activity in CP5, CP6 and beyond.

8.403 Our assessment of the level of civils expenditure required during CP5 is shown in Table 8.33 and illustrated in Figure 8.12 below.

Table 8.33: ORR assessed costs, civil engineering renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	562	548	517	514	531	-	2672
Efficiency	-	4.8%	2.3%	5.5%	4.5%	3.6%	-	19.0%
Post-efficient expenditure	397	536	510	455	432	430	1944	2362

Figure 8.12: Our assessment of efficient expenditure for civil engineering renewals



8.404 For the first two years of CP5 we have adjusted Network Rail's pre-efficient unit costs, accepted unit cost efficiencies, and accepted proposed volumes because its plans are largely based on workbanks (i.e. volumes of work at specific locations).

8.405 For years 3, 4 and 5 of CP5 Network Rail's plans are increasingly reliant on high level modelled outputs. We have less confidence in its volumes, costs and efficiencies. We have adjusted its pre-efficient unit costs and made adjustments to unit cost efficiencies. We have accepted proposed volumes subject to an adjustment mechanism, described below, to deal with the high uncertainty in the plans. Network Rail is to be funded on this basis and these numbers are built into the access charges.

8.406 In total we have reduced Network Rail's planned renewals expenditure on civil engineering works by £281m but we are funding a considerable increase in civils renewals expenditure (£418m more than is planned for CP4, or £565m more after adjusting for CEFA). Recognising that there is high uncertainty around the exact requirement, we propose that civils expenditure is treated differently in the determination, through a 'civils adjustment mechanism'.

Civils adjustment mechanism

8.407 The civils adjustment mechanism will work as follows. In the first two years of the control period Network Rail is expected to deliver the civils renewal volumes proposed in the SBP. Any under-delivery of volumes will have to be caught up. Volumes should not go above the agreed levels, but if they do the normal RAB roll forward policy will apply. Any underspend or overspend for unit costs reasons will be subject to the RAB roll forward policy. (In simple terms, the RAB roll forward policy allows Network Rail to keep 25% of efficient underspend but requires it to bear 25% of overspend.)

8.408 Network Rail must submit a plan in March 2015 for the work it proposes on renewal of civils assets during years 3, 4 & 5 of CP5. It is important that this plan is of a high quality such that we can form a judgement on the volumes and efficient costs of the work for which Network Rail will be funded[139]. We will issue a notice by 31 March 2014 requiring Network Rail to submit a plan no later than 31 March 2015.

[139] Network Rail's licence provides for us to require the company to send us plans which demonstrate its compliance and proposed compliance with meeting its obligation to maintain and renew the network in line with best practice and in an efficient way. The licence also provides for us to specify the structure, format, standard and level of detail of the plan by way of a notice.

We will expect the plan to demonstrate that Network Rail has in place a bottom-up workbank, created by applying its asset policies to the civils asset portfolio, in accordance with condition 1.19 of its Network Licence. The workbank will be specific as to each asset on which work is proposed, its condition (at that time), the scope and cost of the work proposed, and its condition when the work is complete.

8.409 We are taking this step because of the unusual position we find ourselves in, that whereas Network Rail believes a significant backlog of work has developed in civils, its SBP submission has not fully demonstrated this and has also prevented us from concluding on civils expenditure in the determination.

8.410 We will review the plan and form a judgement on the volumes and efficient costs of the work for which Network Rail will be funded (our 2015 civils determination). The volumes and efficient costs could be under or over those assumed in our final determination but, once determined, these will be used to assess Network Rail's efficient delivery during the period. The difference between our 2015 civils determination for the three years and the costs assumed in the PR13 final determination will be settled by a RAB adjustment at the start of CP6.

8.411 Any underspend or overspend on unit costs against the 2015 civils determination will be subject to the normal RAB roll forward policy. If Network Rail under-delivers on volumes it will have to catch up. Over-delivery of volumes will be subject to RAB roll forward.

Drainage assessment

Asset data

8.412 Network Rail's management of its drainage assets has historically been poor. In our PR08 determination we provided funding to improve the condition of these assets. The company was slow to apply this but is now increasing its focus on management of drainage and this is reflected in its production of a new, separate drainage policy. It has also begun to address its poor knowledge of the asset through the IDP. This has delivered a step-change improvement in the drainage asset register and condition information, but gaps remain. Network Rail has not assessed condition for a significant proportion of the surveyed assets (just over 40%) and has not assessed condition for the majority of the pipes as it cannot be determined from the type of inspection carried out for IDP. Pipework condition information will not be complete for at least a year.

Unit costs

8.413 Our audit of drainage unit costs has found that forecasts are highly dependent on a low number of unit costs. Network Rail has more to do to demonstrate that the drainage unit costs are appropriately representative of work types.

Policy

8.414 We welcome Network Rail's increased focus on management of drainage assets, the production of a separate drainage policy and the steps taken to improve asset knowledge. However, because the policy is new and untested there remains uncertainty as to whether the policy is robust, and high uncertainty as to whether the policy is sustainable in the long-term and whether it is yet optimised for lowest whole life cost.

8.415 Network Rail's costs associated with drainage are included within its earthworks and track forecasts. Effective drainage management should result in savings to required work for both track and earthworks. By including drainage costs with these elements Network Rail is incentivised to deliver it effectively which should result in direct savings to track and earthworks activities. However, because of outstanding data deficiency and high uncertainty in the CP5 targets, combined with lack of route information provided for review, we consider the volumes and costs to be highly uncertain. We expect Network Rail to improve this substantially in its delivery plan.

Efficiency

8.416 The efficiency of Network Rail's drainage plans is addressed through our assessment of track and earthworks efficiency.

Buildings assessment

Asset data

8.417 The independent reporter has audited the quality of asset data relating to franchised stations and managed stations. Some minor issues with data governance were identified but it was, on the whole, found to be in line with good practice. The dataset was found to be complete and accurate. Buildings asset data and its governance have recently improved through implementation of an enhanced asset management system which allows better recording of all works carried out on the assets, improved control of data quality and better access to information. Buildings data quality is graded B1.

8.418 Although data quality is good Network Rail has more to do to understand buildings degradation and intervention curves. The independent reporter has found that degradation assumptions are likely to be pessimistic, resulting in modelled results which overestimate volumes.

Unit costs

8.419 The audit of buildings unit costs has found their coverage to be relatively low and there is scope for this to be increased to improve the accuracy of plans. A significant proportion (approximately 40%) of Network Rail's buildings plans are based on less robust non-unitised costs. The unitised costs developed only cover building structures and fabric and omit unit costs for mechanical and electrical systems. The audit has found that the quality of evidence to support adjustments which uplift national unit costs is low. The unit costs used include contingencies of 5% which may be high as Network Rail has not demonstrated that it manages risk appropriately at a programme level. We have found many instances of unit costs which do not appear credible and/or for which units are inconsistently applied. For these reasons we find very significant uncertainty in both Network Rail's buildings pre-efficient unit costs and non-unitised costs and reflect this in our overall adjustment to buildings plans discussed below.

Policy and modelling

8.420 We and the reporter have separately assessed buildings asset policy for franchised stations, managed stations, lineside buildings, light maintenance depots and maintenance delivery units. The CP5 buildings policy refines the policy being applied in CP4 but has improved coverage of the assets. The effect of application of buildings policy is forecast in terms of percentage of asset remaining life. Network Rail's modelling of policy projects that, on average, this will improve marginally over the control period and in the longer term (to CP11) it will improve significantly, suggesting that the policy is both robust and sustainable. However, no compelling justification has been provided that the policy represents an optimised approach to the management of risk on the network. It is also noted that the level of expenditure in CP4 has delivered a marginal improvement in the station stewardship measure (SSM). For stations the CP5 asset policy is considered to have met the robustness and sustainability criteria, but there is high uncertainty around whether it is minimum whole life cost. For light maintenance depots the policy is considered, in the round, to have

met all three criteria. For lineside buildings and maintenance delivery units the policy is considered to have either some uncertainty or moderately high uncertainty in all three criteria. Overall this has resulted in moderately high uncertainty in the CP5 volumes and costs included within Network Rail's plans.

8.421 The franchised stations model shows some inconsistency with asset policy. Degradation curves used were found to generate higher volumes than the reporter considered necessary. The managed stations model is based on inputs from a workbank, with the exception of lifts and escalators. For modelling of other buildings assets some uncertainty was identified in inventory and unit cost inputs. No significant computational errors were identified in any of the buildings models.

8.422 The SBP proposes pre-efficient expenditure on buildings of £1,394m (before embedded efficiencies). This represents a 9% increase on CP4 buildings expenditure, which was itself a significant increase on levels of expenditure in CP3. All categories of buildings renewals are forecast for increases in the level of pre-efficient expenditure with the exception of managed stations. We find that the buildings pre-efficient costs are overstated for franchised stations, lineside buildings and maintenance delivery units. For managed stations we find that projected costs appear reasonable given their bespoke plans. For light maintenance depots we consider that the proposed increase in expenditure on depot plant is justified.

8.423 For all categories of expenditure other than managed stations and depot plant, the high level of pre-efficient costs appears to be driven by policy which is not demonstrably optimised and by highly uncertain unit costs. The independent reporter, Arup, has identified that the degradation profiles used by Network Rail in its whole life cost modelling and in its modelling of policy to produce volumes are pessimistic and therefore tend to overstate the intervention requirements, volumes and expenditure required in the long-term. We have reduced Network Rail's pre-efficient buildings renewals plans by £235m to reflect our findings.

Efficiency

8.424 Our assessment of bottom-up efficiencies finds similar best practice opportunities to those identified by Network Rail's benchmarking work and finds similar levels of efficiency by the end of CP5. For example, there are efficiency opportunities through the improved specification of works including use of innovative materials and through optimisation of policy. The independent reporter's audit of Network Rail's buildings

efficiencies has found some uncertainty in the buildings benchmarking and efficiency evidence presented. Internal benchmarking is considered weak but external benchmarking considered reasonably good. We have applied 50% weighting to our analysis and 50% to Network Rail's which reflects our view of the robustness and completeness of the buildings benchmarking and efficiency work conducted by Network Rail.

Routes

8.425 There are some anomalies in the route plans between the average level of expenditure forecast per station. The plans for the Anglia route do not demonstrate clearly how the transfer of maintenance and renewal responsibilities to the Greater Anglia franchise has been allowed for. We have not made additional adjustment for this since it is covered by the overarching adjustment applied.

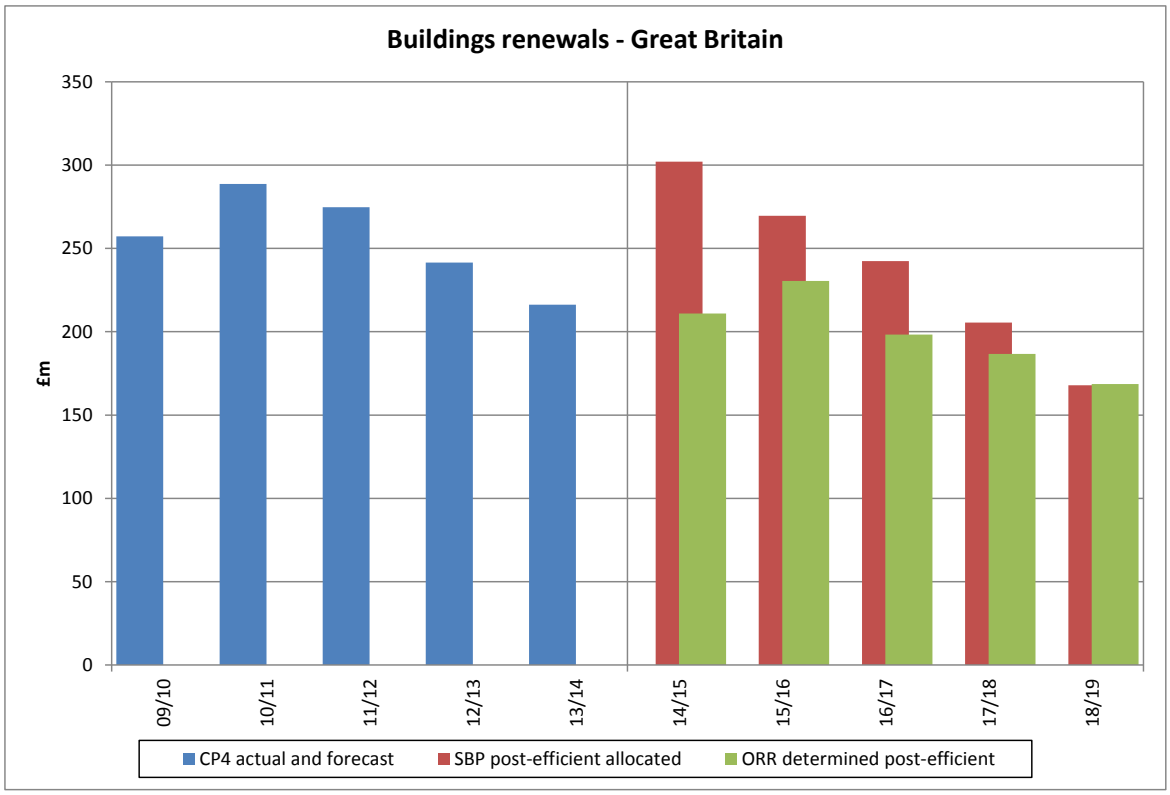
Findings

8.426 Our assessment of the level of buildings expenditure required during CP5 is shown in Table 8.34 and illustrated in Figure 8.13 below.

Table 8.34: ORR assessed costs, buildings renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	227	259	231	227	215	-	1159
Efficiency	-	7.1%	4.3%	3.5%	4.1%	4.7%	-	21.6%
Post-efficient expenditure	216	211	230	198	187	169	1279	995

Figure 8.13: Our assessment of efficient expenditure for buildings renewals



8.427 In total we have reduced Network Rail's planned renewals expenditure on buildings by £193m.

Electrical power assessment

Asset data

8.428 Network Rail has improved its asset data relating to electrical power assets through the ADIP. It has bettered its understanding of asset degradation and failure modes by collating and analysing historical asset failure data and drawing on the knowledge of asset specialists. The independent reporter's audit of asset data quality has given overhead line data a grading of B2, showing governance to be largely in line with good practice but with some improvements to documentation required and/or evidence required. For conductor rail the audit's findings were similar for governance, but the accuracy of data was found to be poor, resulting in a grading of B4.

Unit costs

8.429 The reporter's audit of unit costs has identified that roughly half of the SBP expenditure submission for electrical power and fixed plant is driven by non-unitised costs. The evidence supporting these costs is low and this leads to greater uncertainty in the plan.

8.430 Where unit costs have been used in building plans these have been developed using an appropriate methodology and are aligned with good practice. The reporter has traced the rates through to the SBP submission. Network Rail has not provided a full justification of the overlays applied to the unit costs and, as with other assets, has not demonstrated a programme level overview of risk estimation. For these reasons we have applied a 2% reduction to the pre-efficient plans for electrical power and fixed plant.

Policy and modelling

8.431 Network Rail has put a lot of work into producing an electrical power asset policy which is a significant improvement on current practice. The new policy addresses safety more comprehensively. For the first time it is based on whole life cost modelling. This work has improved the justification and modelling of policy. However, the policy introduces new ways of working, for example introduction of mid-life refurbishment of overhead lines, which are not yet fully tested and this results in some uncertainty as to whether the policy is robust and sustainable.

8.432 Network Rail has assumed that sustaining electrical power delays (causing disruption greater than 10 minutes) at the level forecast for the end of CP4 will support the delivery of the performance outputs required by the HLOSs. This appears to be a reasonable assumption but Network Rail has not demonstrated a clear link from this measure to its delivery of performance. Through development of the asset policy, Network Rail has made progress with linking work activities in its strategic planning models to the electrical power asset performance indicators to provide assurance that the forecast levels can be achieved. However, discussion with the routes has made it clear that the workbanks are sometimes inconsistent with the central modelling. Our discussions with the routes have also highlighted that they have not consistently provided feedback on the assumptions used in strategic planning models. The disconnects between the strategic planning models (which are linked to asset performance indicators) and the workbanks that underpin the SBP expenditure forecasts, lead to some uncertainty around the robustness of the policy.

8.433 In considering sustainability we have assessed whether electrical power asset performance and condition measures can be maintained in the long-term without an undeliverable spike in work volume. In its SBP, Network Rail has forecast renewals expenditure and remaining life over control periods CP5 to CP11. It forecasts that the

long-term profile of expenditure will be reasonably steady, between £0.8bn and £1bn in most control periods. The average remaining life is forecast to reduce from 61% to 51% by CP11. This forecast reduction appears reasonable given the substantial programme of electrification that is planned for CP5.

8.434 The long-term forecasts of electrical power expenditure and condition outputs are based primarily on the central models. The disconnect between central modelling and the bottom-up workbanks that represent the actual work forecast on-site raises similar issues to those raised in our test of robustness.

8.435 The electrical power asset base is varied and includes both linear (for example cables and overhead lines) and point assets (for example switchgear and transformers). To select the assets to be analysed Network Rail has completed an asset criticality ranking using parameters including previous expenditure and impacts on performance, safety environment, operating costs and system capability. This asset criticality prioritised the following assets for whole life costs analysis:

(a) overhead line equipment;

(b) signalling power supply systems (PSPs and signalling power distribution cables);

(c) HV switchgear for the AC and DC electrification systems;

(d) conductor rail; and

(e) HV cables on the DC electrification systems.

8.436 Network Rail has used a sound approach to the whole life cost modelling. However, the determination of optimum efficient plans using whole life cost analysis tools is highly dependent on the quality of information used as inputs and assumptions. Network Rail has recognised the quality of asset data for electrical power assets has not been good and has developed programmes to improve this. Due to the time this takes, Network Rail has used expert knowledge supported by sensitivity analysis to determine degradation rates rather than comprehensive asset information.

8.437 Network Rail's centrally modelled figures are derived in a strategic planning model. This uses outputs from the whole life cost models and applies the policy to the electrical power asset base. This further emphasises the requirement for reliable asset inventory data to ensure the outputs of this model will provide a robust forecast

of expenditure. The whole life cost models have influenced approximately 50% of the expenditure forecast in the SBP for electrical power renewals.

8.438 The electrification and power model was found to be consistent with policy. No material issues were found with computational accuracy in modelling costs and volumes for CP5.

Efficiency

8.439 We have assessed the electrical power efficiency initiatives proposed and agree they should deliver long-term efficiencies. Network Rail has carried out benchmarking against the electricity distribution and transmission industry. Arup's review of Network Rail's work to assess potential electrical power renewal efficiencies concluded the initiatives are well founded in terms of the range and scope covered. Network Rail's route teams have also included some locally derived efficiencies. The routes have not provided detailed delivery plans for these additional efficiencies. Due to the relatively robust approach Network Rail has taken to developing the majority of its electrical power and fixed plant efficiencies, we have applied 75% weighting to its analysis and 25% to our analysis.

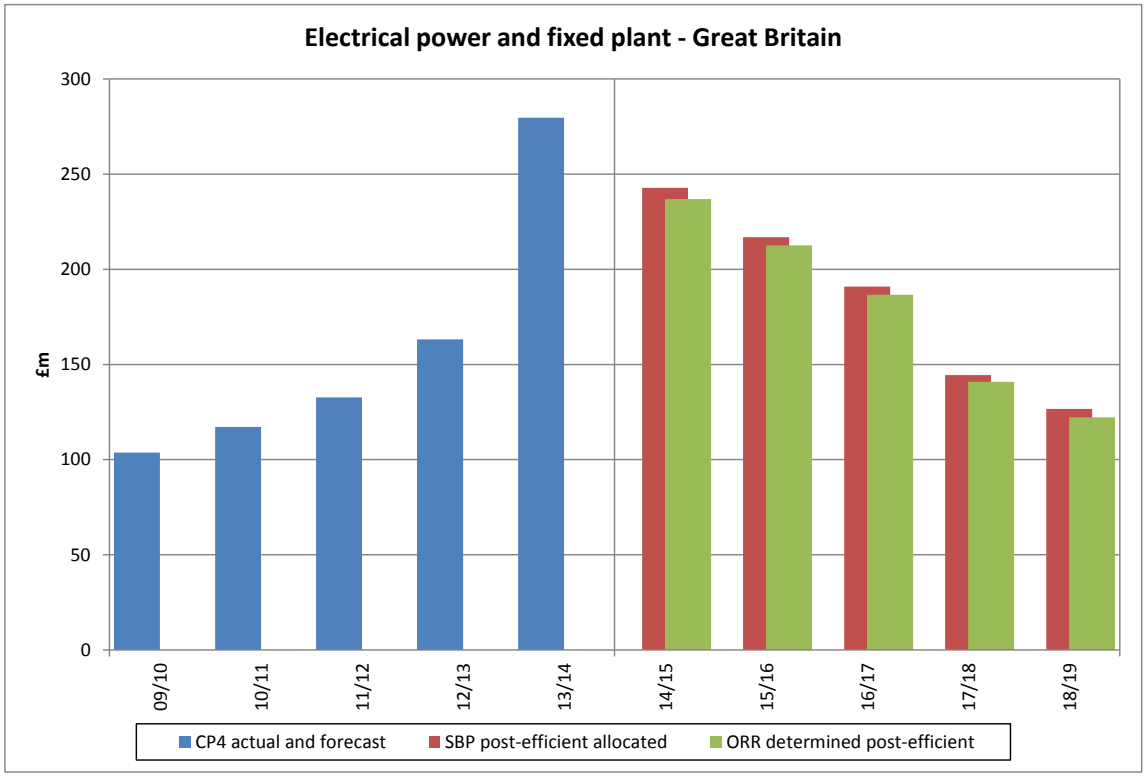
Findings

8.440 Our assessed efficient expenditure for electrical power and fixed plant renewal is illustrated below. We accept the need for an increased level of expenditure relative to CP4. This is driven by the new asset policy which requires more mid-life refurbishment, by the advanced renewal of electrification assets due to enhancement works and by new information which has revealed the need for high levels of signalling power cable renewals to address a backlog of work. The high expenditure in the final year of CP4 is due to a large increase in expenditure on overhead line renewals, DC distribution renewals, supervisory control and system capacity improvements. The profile in CP5 is largely driven by high levels of efficiency, including efficiency from application of the new asset policy.

Table 8.35: ORR assessed costs, electrical power and fixed plant renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	279	266	244	195	173	-	1157
Efficiency	-	15.1%	5.7%	4.4%	5.7%	2.4%	-	29.5%
Post-efficient expenditure	280	237	213	187	141	122	797	899

Figure 8.14: Our assessment of efficient expenditure for electrical power and fixed plant renewals



Telecoms assessment

Asset data

8.441 Network Rail's telecoms plans are based on asset knowledge collected through its Telecoms Decision Support Tool (DST). This provides a structured approach to collection of telecoms asset data and renewal planning at half nominal life and 2 years prior to nominal renewal date. The DST system is currently spreadsheet based and would benefit from being moved to a more robust and controlled platform. Ellipse is

used as the telecoms asset register. There is currently no direct link between Ellipse and the fault management system (FMS). Asset information management and data quality is being addressed through the Asset Data Improvement Programme (ADIP) and ORBIS.

Unit costs

8.442 The independent reporter's audit of telecoms unit costs found that a high proportion (52%) of telecoms plans was based on non-unitised costs. The projection of these costs and their overlays (e.g. 'abnormals') has not been supported by sufficient evidence and this results in a higher uncertainty relating to telecoms pre-efficient expenditure forecasts. Network Rail's unit costs are built up using an appropriate methodology but treatment of risk and contingency is not clear and, as with other asset categories, no programme level view of risk estimation has been demonstrated. We have applied a 2% reduction to account for duplication and overestimation of risk overlays.

Policy and modelling

8.443 Network Rail Telecoms (NRT) was set up in August 2011, partly in recognition of the need to manage the telecoms assets on a holistic basis, over the full life of the assets.

8.444 Network Rail recognises that its assets, in particular the Fixed Telecoms Network (FTN), have potential benefits both in terms of added services and commercial opportunities. However, the CP5 SBP submissions exclude all commercial activities, costs and revenues.

8.445 Network Rail has carried out whole life cost modelling in support of its telecoms asset policy. This is a positive step but we consider that the modelling does not yet provide sufficient coverage of the asset base. In depth modelling has only been carried out for processor controlled concentrators. The modelling has been hampered by data quality with extra work carried out to verify FMS data. There is therefore potential for further optimisation of the policy through wider use of the model and improved input data. The policy proposes a move to a more targeted approach of component renewal to maximise the asset life, integrated with programmes of major interventions relating to NOS. This approach appears sound.

8.446 Telecoms maintenance regimes are to be based on the criticality of the asset and based around delivery of Service Level Agreements (SLA) with NRT's clients, the

routes. SLAs have not been implemented or fully tested and it will not be clear whether the proposed SLAs are appropriate until the middle of CP5. We therefore do not yet consider that delivery of SLAs has been demonstrated to be a robust or sustainable way of maintaining the assets.

8.447 The asset policy document does not capture the portfolio of telecoms assets consistently. This needs to be resolved to ensure robust reporting in CP5. The policy is also unclear on asset ownership.

8.448 Network Rail has developed its CP5 plans based on application of the policy. Its plans show a reduction in overall expenditure from CP4 driven by the completion of two major programmes of work: GSM-R and FTN.

8.449 We have made adjustments to the pre-efficient plans for telecoms renewals where Network Rail has not provided sufficient information to justify them. We have reduced expenditure by £33m in the first year of CP5 where plans submitted are not in line with the plans submitted by NRT and smaller adjustments in later years.

8.450 The telecoms model was found to be consistent with policy. No material issues were found with computational accuracy in modelling costs and volumes for CP5.

Efficiency

8.451 Our assessment of the efficiencies available for telecoms renewals has found opportunities in the development and sharing of smoothed workbanks, improved management of the supply chain and through application of innovative solutions. We find a slightly lower overall efficiency available than Network Rail's own analysis.

8.452 The reporter's audit of Network Rail's telecoms benchmarking and efficiency found that both internal and external benchmarking was limited in coverage and identified efficiencies were not reflected in CP5 workbanks. We have given higher weight (75%) to our analysis given our view of the quality of Network Rail's benchmarking and efficiency analysis.

Routes

8.453 There are no specific route plans for telecoms with assets remaining under the direct control of NRT, but route staff are used to provide first level failure response.

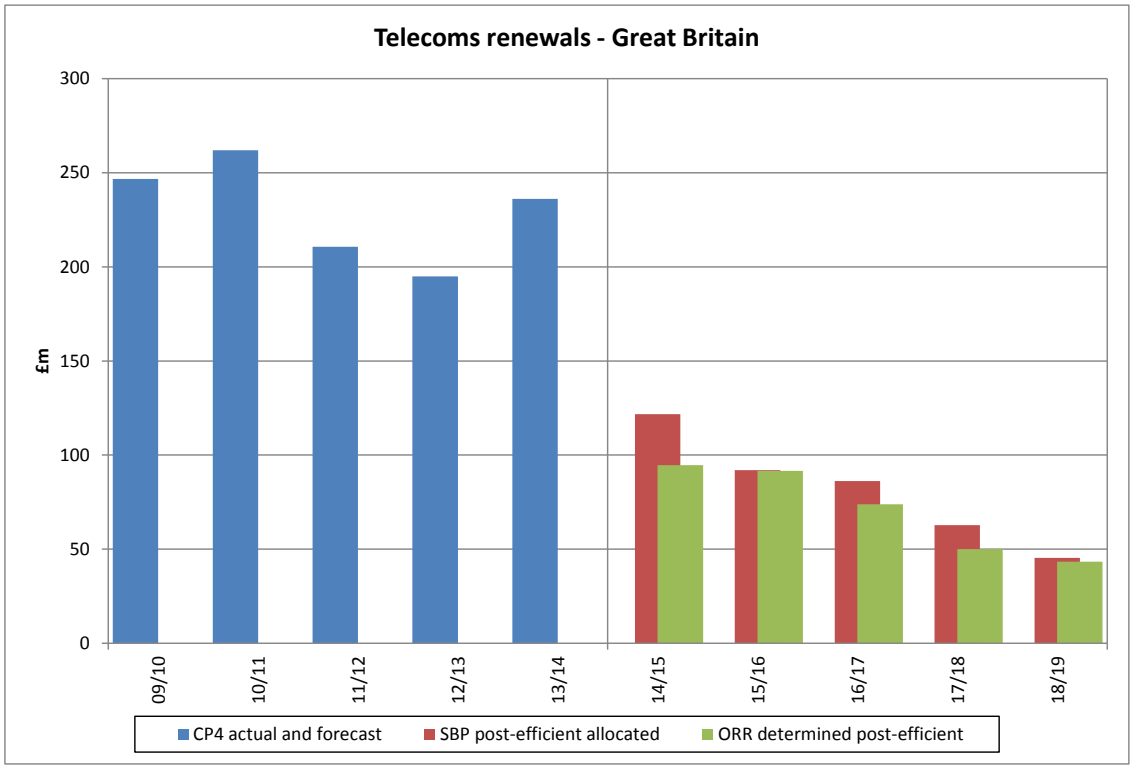
Findings

8.454 Our assessed efficient expenditure for telecoms renewals is illustrated below.

Table 8.36: ORR assessed costs, telecoms renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	98	98	82	58	52	-	388
Efficiency	-	3.7%	3.4%	3.5%	3.3%	3.6%	-	16.2%
Post-efficient expenditure	236	95	92	74	50	43	1150	354

Figure 8.15: Our assessment of efficient expenditure for telecoms renewals



8.455 Expenditure in CP5 is markedly lower than in CP4 due to the completion of major programmes of work delivering FTN and GSM-R.

Wheeled plant assessment

Asset info

8.456 Network Rail acknowledges that the current level of information available for wheeled plant is inconsistent and limited, which is largely a function of the existing contractual arrangements. This is disappointing, but Network Rail recognises the issue and has taken steps to address this shortcoming through the standardisation of contracts and

population of a fleet database, the Fleet Asset Management System (FAMS). Poor asset information hinders Network Rail's ability to develop an optimised asset policy and this is reflected in our assessment. From the information which is available, fleet condition is shown to be good, with high availability and reliability levels.

Unit costs

8.457 The independent reporter's audit of wheeled plant unit costs has found that a lack of clear evidence that rates have been built up using a robust methodology. It highlights that, for larger bespoke plant items and systems costs will largely be driven by the market's response to a procurement exercise and that this leads to real difficulties in projecting costs. For road vehicles the reporter notes that Network Rail has not considered any residual value at the time of disposal. This supports our adjustment to pre-efficient expenditure on road rail vehicles as described later.

8.458 We have made no adjustment to wheeled plant unit costs for management of risk or contingency as Network Rail has not included any specific allowance.

Policy and modelling

8.459 The wheeled plant policy is a significant improvement on CP4 policy but it is still considered relatively immature. The policy attempts to draw together coherent management plans for an extensive but varied set of assets. The assets vary in terms of age, type and complexity of vehicles, and each has its own set of asset management requirements.

8.460 Following review of the detail that sits beneath the policy we believe that the focus of extending maintenance and overhaul periodicities forms part of a considered and assessed plan for the on-going stewardship of the assets rather than simply a drive to reduce and extend maintenance. We note that the policy does not cover all Network Rail's fleet plans for CP5. The policy only covers those vehicles to maintain the network to the anticipated work volumes. It does not cover route specific vehicles or certain enhancement works, such as Thameslink which has its own provision for fleet procurement.

8.461 The wheeled plant strategic planning model was found to be generally consistent with asset policy, except for the road fleet which was assumed to be replaced every four years (whereas policy states every five). There were no material unexplained issues

with input data and no errors found in computation. We have made an adjustment to expenditure on road vehicles of £3m to reflect this issue.

8.462 Because of the limited information available (as described above), the outputs from the policy are very crudely and loosely defined. Success is proposed to be measured by the delivery of the planned shifts and by having a fleet condition no worse than at exit from CP4. Network Rail has proposed no specific monitoring targets for fleet in CP5.

8.463 We are concerned that there is some disconnect between route plans and central modelling of fleet requirements.

8.464 We have reviewed the costs and volumes included in the SBP which are associated with implementation of the fleet policy. The fleet size required to support the fleet policy is modelled by assessing the projected work provided by the routes with perturbation factors such as the unavailability of possessions and machine failure incorporated. Given the high availability and reliability demanded of the fleet to support the projected work, we are surprised that there has been little consideration of any benefits which could accrue from the provision of additional fleet resource. For example, there has been little consideration of any benefits which could accrue from the provision of additional fleet resource to provide resilience to changes in work demand, fleet performance (especially on critical fleets) or from the point of view of having additional capacity to perform more work.

8.465 Despite our concerns over asset information and demand modelling, we consider that Network Rail has demonstrated that its fleet policy is capable of delivering the planned outputs for CP5. We also consider that it has made the case that the fleet policy is capable of managing the fleet asset sustainably in the long-term. There is further work required to demonstrate how effective the policy would be if faced with a change in the planned outputs, because there appears to be little spare capacity in meeting the planned workload.

8.466 Expenditure in CP5 is forecast to be higher than in CP4. Network Rail has proposed an investment of £141m to make improvements to road rail vehicles, citing improved safety as the main driver for the investment. We have engaged the independent reporter to review the proposal and its report will be finalised shortly. Its findings will be reflected in our final determinations. Further detail is provided in chapter 11.

Efficiency

8.467 Network Rail has provided information on the proposed fleet efficiencies, supported by reasoned justification. The two principal areas proposed are improved procurement and efficiencies in the vehicle maintenance and overhaul process. Our analysis finds slightly higher available efficiencies driven by improved procurement policy. The assumed level of efficiencies is considered challenging but realistic if suitably managed.

Route plans

8.468 There is some discrepancy between fleet policy and fleet requirements as set out in route plans. This has been considered by Network Rail and independently examined with the conclusion that any difference should be manageable.

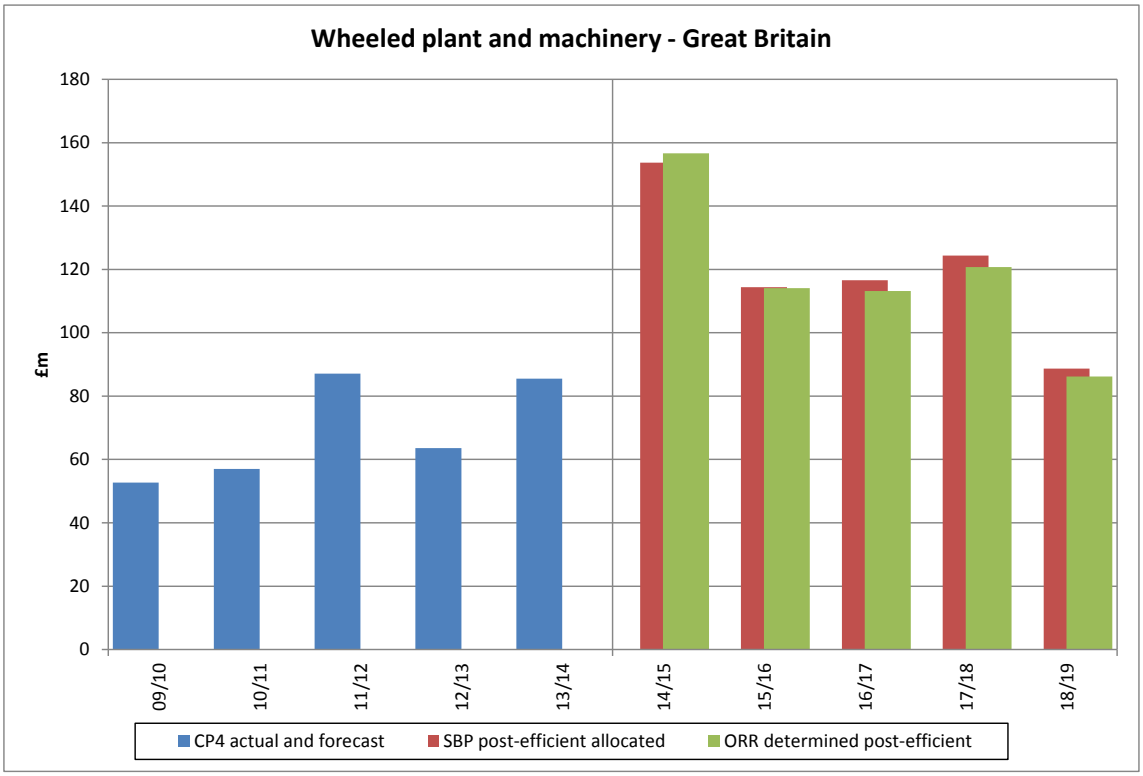
Findings

8.469 Our assessment of the level of wheeled plant expenditure required during CP5 is illustrated below.

Table 8.37: ORR assessed costs, wheeled plant and machinery renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Pre-efficient expenditure	-	167	122	121	130	93	-	634
Efficiency	-	6.4%	0.2%	0.2%	0.2%	0.4%	-	7.5%
Post-efficient expenditure	86	157	114	113	121	86	346	591

Figure 8.16: Our assessment of efficient expenditure for wheeled plant and machinery renewals



8.470 The large increase in expenditure in CP5 is largely driven by increased expenditure on road-rail vehicles and provision of additional high output fleets. The peak of expenditure in 2014-15 is driven by expenditure on high output and seasonal plant.

Other renewals expenditure assessment

IT and asset information strategy (ORBIS)

8.471 Network Rail has proposed an increase in IT expenditure of approximately £150m above CP4 levels. This increase is based on benchmarking against other organisations but no clear plans have been produced for how this will be spent or what it will deliver.

8.472 In addition to this Network Rail has proposed expenditure on ORBIS of £173m during CP5 to deliver improved asset information management. These plans were assessed by the independent reporter, AMCL, in late 2012. The reporter found that the ORBIS vision and roadmap represented a major step forwards in terms of Network Rail's approach to asset information which addresses the existing shortfall between Network Rail's asset information capability and current best practice.

8.473 The reporter found certain elements of the programme that needed further development to address gaps to best practice, particularly the asset information specification and detailed system architecture.

8.474 The initial business case for ORBIS was found to be strong and based on sound evaluation for a programme in its early definition phase. The base case was strongly positive, delivered a good cost-benefit ratio and started delivering a positive net cost-benefit in a short period of time (during CP6).

8.475 We support Network Rail's plans to improve its information management but consider that these plans need to be considered in conjunction with other IT expenditure as both relate to business change programmes and there is not a clear distinction between them. Network Rail has not presented sufficient justification for its proposed increase in IT expenditure over and above its ORBIS expenditure. We have assessed the total efficient expenditure for IT and ORBIS based on a continuation of CP4 levels of expenditure. The company has recently submitted some further evidence which we will consider in our final determination.

Property

8.476 Our assessment of Network Rail's plans for property renewals finds that expenditure levels before efficiency are reasonable but that a higher level of efficiency is available. We assume an efficient level of expenditure of £113m.

Intelligent infrastructure

8.477 We have assessed Network Rail's proposal for expenditure of £95m on further roll-out of remote condition monitoring. The proposed further implementation appears reasonable but we have not yet seen sufficiently detailed plans. We have asked Network Rail to quantify what this expenditure will deliver and it has presented high level information. We expect Network Rail to set out detailed plans, including milestones, in its delivery plan. We will monitor delivery against this plan.

Faster and safer isolations

8.478 Network Rail has proposed an investment of £230m in CP5 for taking safer and faster isolations, citing safety improvements as the main reason for the investment. £90m was proposed for improvements on the AC network and £100m for the DC network. The remaining £40m of expenditure was for further DC improvements. The investment of £190m for taking safer and faster isolations on the AC and DC network

is considered appropriate but we consider that there is insufficient justification for the £40m for further DC improvements. We have applied an efficiency overlay in line with our assessment of efficiency for electrical power and fixed plant renewals. We assess efficient expenditure of £163m.

Alerts for track workers

8.479 Network Rail's proposal for £100m expenditure on a system for providing alerts to track workers is reviewed in chapter 11. We have made an allowance of £10m for the trialling of the proposed system in CP5.

Small plant

8.480 Network Rail's plans for renewal of small plant are considered reasonable and we have made no adjustment, giving efficient expenditure of £51m in CP5.

Research and development

8.481 Network Rail has presented plans for expenditure of £300m on research and development. We fully support an increased focus on research and development. The HLOSs included a £50m innovation fund. In addition to that fund we are developing a matched funding financial incentive as described in chapter 19 and have therefore not included funding for research and development in our assessed renewals expenditure.

Long-run renewals

8.482 Network Rail presented its plans for renewals up to and including CP11. We have conducted a review of these plans including a bottom-up review of plans for CP5 and CP6. We have assumed that the key identified efficiencies will be realized by the end of CP6. Beyond CP6 we have assumed that there will be further, as yet unidentified, efficiency improvements. We have assumed on-going efficiencies of 2% per control period. Our assessment of the long-run renewal expenditure is the average of the efficient renewal expenditure requirements from CP5 to CP11.

Our conclusions – maintenance

8.483 Our methodology as described above has resulted in our judgement on the level of efficient maintenance expenditure Network Rail should need to incur to deliver its required outputs. This is set out in the tables below. In comparison to our advice to

ministers documents, our conclusions on maintenance expenditure are within the range we set out for both Scotland and England & Wales.

8.484 We have made no explicit adjustment to maintenance volumes as proposed by Network Rail. The company will set out its proposed volumes consistent with delivery of its asset policies and maintenance strategy in its delivery plan. The company will need to provide an explanation where its delivery plan volumes are different to the volumes submitted following the SBP, a subset of which is shown in Table 8.1. We will monitor maintenance volumes during the period against its delivery plan. Network Rail will need to provide us with justification for any material divergences between the actual volumes delivered in a year and those forecast in the delivery plan. We will also monitor on a forward looking basis, considering whether the volumes are likely to be delivered.

Table 8.38: ORR assessed costs, maintenance, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Network Rail's SBP								
Pre-efficient expenditure	-	1145	1166	1170	1166	1166	-	5813
Efficiency	-	5.4%	2.6%	2.4%	1.9%	2.2%	-	13.7%
Post-efficient expenditure	982	1083	1074	1052	1029	1006	5406	5243
ORR assessed costs								
Pre-efficient expenditure	-	1131	1154	1156	1154	1154	-	5751
Efficiency	-	4.0%	3.4%	3.5%	3.4%	3.4%	-	16.5%
Post-efficient expenditure	982	1086	1070	1035	998	963	5406	5152

Table 8.39: ORR assessed costs, maintenance, England & Wales

£m (2012-13 prices)	CP4			CP5			CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Network Rail's SBP								
Pre-efficient expenditure	-	1036	1048	1053	1051	1056	-	5243
Efficiency	-	5.7%	2.1%	2.5%	2.0%	2.7%	-	14.1%
Post-efficient expenditure	893	977	968	948	927	906	4928	4726
ORR assessed costs								
Pre-efficient expenditure	-	1024	1037	1041	1040	1045	-	5188
Efficiency	-	4.0%	3.4%	3.5%	3.4%	3.5%	-	16.7%
Post-efficient expenditure	893	983	961	931	898	871	4928	4644

Table 8.40: ORR assessed costs, maintenance, Scotland

£m (2012-13 prices)	CP4			CP5			CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Network Rail's SBP								
Pre-efficient expenditure	-	109	118	117	115	110	-	570
Efficiency	-	3.3%	6.7%	1.4%	0.8%	-2.2%	-	9.9%
Post-efficient expenditure	89	105	106	104	102	100	478	517
ORR assessed costs								
Pre-efficient expenditure	-	108	117	115	114	109	-	563
Efficiency	-	3.8%	3.2%	3.3%	3.1%	3.1%	-	15.5%
Post-efficient expenditure	89	103	109	104	100	92	478	508

Maintenance, by asset

Table 8.41: ORR assessed costs, efficient maintenance by asset, Great Britain

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Track							
Network Rail SBP	420	414	404	395	384	372	1969
ORR assessed	420	418	408	393	377	361	1958
Signalling							
Network Rail SBP	158	151	148	146	143	141	729
ORR assessed	158	153	149	145	141	138	728
Civils and buildings							
Network Rail SBP	35	82	82	82	81	82	408
ORR assessed	35	81	81	80	79	79	400
Electrification and fixed plant							
Network Rail SBP	73	85	88	87	87	88	435
ORR assessed	73	90	92	90	87	86	445
Telecoms							
Network Rail SBP	21	21	20	19	19	18	97
ORR assessed	21	21	20	19	18	18	95
Other maintenance							
Network Rail SBP	274	216	213	206	202	196	1032
ORR assessed	274	220	212	203	195	187	1017
Reactive maintenance adj.							
Network Rail SBP	0	115	119	117	113	110	575
ORR assessed	0	103	108	103	99	95	507

Maintenance by route

8.485 Our assessed expenditure on maintenance by route is set out in Table 8.42. These feed into our calculation of the REBS baselines as explained in annex D.

Table 8.42: ORR assessed costs, efficient maintenance by route

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Anglia							
Network Rail SBP	99	104	103	102	99	94	503
ORR assessed	99	103	102	100	96	91	493
East Midlands							
Network Rail SBP	50	58	58	56	54	54	280
ORR assessed	50	56	55	53	52	50	265
Kent							
Network Rail SBP	67	75	73	71	70	68	355
ORR assessed	67	74	72	68	66	64	344
LNE							
Network Rail SBP	154	160	162	158	159	161	800
ORR assessed	154	164	161	154	151	148	779
LNW							
Network Rail SBP	252	271	267	262	255	247	1302
ORR assessed	252	273	265	257	247	240	1281
Scotland							
Network Rail SBP	89	105	106	104	102	100	517
ORR assessed	89	103	109	104	100	92	508
Sussex							
Network Rail SBP	52	57	57	53	52	50	269
ORR assessed	52	57	55	52	51	48	263
Wales							

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Network Rail SBP	52	61	59	59	58	57	294
ORR assessed	52	60	58	57	55	54	284
Wessex							
Network Rail SBP	78	83	82	81	77	73	395
ORR assessed	78	87	85	83	78	73	407
Western							
Network Rail SBP	87	109	108	106	103	103	528
ORR assessed	87	109	108	105	102	102	527

Our conclusions – renewals

8.486 Our methodology as described above has resulted in our judgement on the level of efficient renewals expenditure Network Rail should need to incur to deliver its required outputs. This is set out in the tables below. In comparison to our advice to ministers documents, our conclusions on renewals expenditure are within the range (towards the high end) that we set out for Scotland but above the range we set out for England & Wales. This is driven by a large increase in Network Rail's pre-efficient plans between the IIP and the SBP, particularly relating to civils renewals, accelerated track renewals, IT and other investment expenditure.

8.487 The company will set out its proposed renewals volumes consistent with delivery of its asset policies in its delivery plan. The company will need to provide an explanation where its delivery plan volumes are different to the volumes submitted in the SBP, a subset of which is shown in Tables 8.11 to 8.13. We will monitor renewal volumes during the period against its delivery plan. Network Rail will need to provide us with justification for any material divergences between the actual volumes delivered in a year and those forecast in the delivery plan. We will also monitor on a forward looking basis, considering whether the volumes are likely to be delivered.

Table 8.43: ORR assessed costs, renewals, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Network Rail's SBP								
Pre-efficient expenditure	-	3017	3202	3243	3163	3129	-	15754
Efficiency	-	8.2%	2.7%	2.8%	1.6%	1.4%	-	15.7%
Post-efficient expenditure	2784	2770	2861	2818	2704	2638	12833	13791
ORR assessed costs								
Pre-efficient expenditure	-	2697	2925	2924	2879	2845	-	14269
Efficiency	-	8.2%	3.7%	4.2%	3.0%	2.8%	-	20.1%
Post-efficient expenditure	2784	2475	2586	2476	2365	2272	12833	12173

Table 8.44: ORR assessed costs, renewals, England & Wales

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Network Rail's SBP								
Pre-efficient expenditure	-	2697	2810	2885	2835	2809	-	14036
Efficiency	-	8.0%	2.8%	2.6%	1.7%	1.5%	-	15.7%
Post-efficient expenditure	2541	2481	2511	2512	2426	2367	11476	12297
ORR assessed costs								
Pre-efficient expenditure	-	2409	2562	2599	2581	2555	-	12707
Efficiency	-	8.2%	3.7%	4.1%	3.0%	2.8%	-	20.1%
Post-efficient expenditure	2541	2211	2264	2202	2122	2042	11476	10840

Table 8.45: ORR assessed costs, renewals, Scotland

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Network Rail's SBP								
Pre-efficient expenditure	-	320	392	358	328	320	-	1718
Efficiency	-	9.7%	1.3%	4.0%	0.9%	0.3%	-	15.5%
Post-efficient expenditure	243	289	350	306	278	271	1356	1493
ORR assessed costs								
Pre-efficient expenditure	-	287	363	324	298	290	-	1563
Efficiency	-	8.3%	3.4%	4.9%	2.9%	3.0%	-	20.7%
Post-efficient expenditure	243	264	322	274	244	230	1356	1333

Renewals, by asset

Table 8.46: ORR assessed costs, efficient renewals by asset, Great Britain

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Track								
Network Rail SBP	816	720	684	725	669	633	3762	3431
ORR assessed	816	705	657	677	612	571	3762	3221
Signalling								
Network Rail SBP	533	765	821	742	616	546	2421	3490
ORR assessed	533	736	787	708	586	519	2421	3335
Civils								
Network Rail SBP	397	565	539	525	506	509	1944	2644
ORR assessed	397	536	510	455	432	430	1944	2362
Buildings								

£m (2012-13 prices)	CP4	CP5					CP4	CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total	Total
Network Rail SBP	216	302	270	242	205	168	1279	1187
ORR assessed	216	211	230	198	187	169	1279	995
Electrical power & fixed plant								
Network Rail SBP	280	243	217	191	144	127	797	922
ORR assessed	280	237	213	187	141	122	797	899
Telecoms								
Network Rail SBP	236	122	92	86	63	45	1150	408
ORR assessed	236	95	92	74	50	43	1150	354
Wheeled plant & machinery								
Network Rail SBP	86	154	114	117	124	89	346	598
ORR assessed	86	157	114	113	121	86	346	591
IT								
Network Rail SBP	80	123	150	123	109	109	467	613
ORR assessed	80	57	63	63	68	86	467	338
Property								
Network Rail SBP	18	23	30	22	28	22	254	124
ORR assessed	18	22	28	20	24	19	254	113
Other renewals								
Network Rail SBP	121	-130	64	164	352	500	148	949
ORR assessed	121	-176	0	83	244	322	148	473
Reactive maintenance adj.								
Network Rail SBP	0	-115	-119	-117	-113	-110	0	-575
ORR assessed	0	-103	-108	-103	-99	-95	0	-507

Renewals by route

8.488 Our assessed expenditure on renewals by route is set out in Table 8.47. These feed into our calculation of the REBS baselines as explained in annex D.

Table 8.47: ORR assessed costs, efficient renewals by route

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Anglia							
Network Rail SBP	237	202	229	275	238	202	1146
ORR assessed	237	184	210	252	214	175	1034
East Midlands							
Network Rail SBP	140	161	146	126	120	109	662
ORR assessed	140	146	132	111	105	93	587
Kent							
Network Rail SBP	214	228	221	198	195	206	1049
ORR assessed	214	205	198	173	171	180	928
LNE							
Network Rail SBP	445	422	475	443	491	536	2367
ORR assessed	445	382	434	392	434	471	2113
LNW							
Network Rail SBP	557	546	560	577	539	534	2755
ORR assessed	557	473	497	498	466	457	2391
Scotland							
Network Rail SBP	243	289	350	306	278	271	1493
ORR assessed	243	264	322	274	244	230	1333
Sussex							
Network Rail SBP	182	169	187	160	172	154	842
ORR assessed	182	151	171	140	152	131	745
Wales							

£m (2012-13 prices)	CP4	CP5					CP5
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Network Rail SBP	168	195	157	165	123	115	755
ORR assessed	168	173	140	143	108	100	664
Wessex							
Network Rail SBP	200	219	216	261	249	211	1156
ORR assessed	200	190	190	225	217	180	1003
Western							
Network Rail SBP	303	339	320	307	298	301	1565
ORR assessed	303	307	291	268	255	254	1375

International top-down benchmarking

8.489 Benchmarking a firm's costs to those of its peers is widely used among regulators to help inform the scope to which there may be opportunities to improve efficiency or reduce cost. This approach formed an important element of ORR's assessment at PR08, and for this periodic review we have updated the previous models and approaches used, developed these to take advantage of developments in the field, and addressed some of the questions raised following the PR08 analysis. We are grateful to the Institute for Transport Studies at the University of Leeds for the technical advice and support they have provided to this work, in particular their assistance in identifying and making use of developments in the field since our PR08 work.

8.490 Given Network Rail's position as a national monopoly without similar domestic comparators, it is natural to look to the managers of rail infrastructure in other countries to inform comparisons. This is where international benchmarking can provide important insights into how overall costs of operating and maintaining railways can vary across countries.

8.491 In comparing across countries it is important to choose a set of comparators that have reasonably similar operating conditions so that efficiencies can be separated out from other factors. In selecting the comparators we have focused on other European countries for which data are available and the infrastructure and operating conditions

are broadly similar. Analysis has also been undertaken to gauge how sensitive the results are to this selection of comparators.

8.492 Even if comparators are similar it is inevitable that differences will remain. For example, the exact size of the network, balance between single and multiple track, and intensity of usage will all vary from country to country. These all impact on the costs of maintaining and renewing the network, and the relationship between these variables and overall cost is not necessarily straightforward. For example it is not necessarily the case that a railway double the size of another will incur double the cost. To estimate how much each of these factors impact on overall costs we use statistical techniques to estimate the relationships.

8.493 After these techniques have been used, the remaining differences in the data between countries (the 'residuals') will then comprise random differences between countries (for example due to natural events in a particular year), differences between countries due to factors that cannot be directly taken into account (for example different reliability requirements for which consistent cross country information is not available), and true underlying differences in efficiency. The objective of this work is to identify these true underlying differences in efficiency. The following section sets out a summary of a range of statistical techniques and approaches to do this.

Approaches

8.494 There is a wide set of statistical techniques available to benchmark costs across countries. These all use the data to estimate an efficiency 'frontier', which can be set by the best performing firm in the sample (either overall, so taking all years available into account, or for a particular year), or an adjusted frontier which takes into account some of the unobserved factors mentioned above. The distance from any particular firm to this frontier provides a measure of its inefficiency. All these approaches have a common limitation in that they are derived from the data itself, and so the frontier has to be defined by the set of counties included in the dataset. If there is a more efficient country for which we do not have data, the frontier will not be as challenging as it could be, resulting in inefficiency estimates that are systematically conservative.

8.495 There are two main approaches that have been used in this work. These are models using Corrected Ordinary Least Squares (COLS) and Stochastic Frontier Analysis (SFA).

Corrected Ordinary Least Squares

8.496 This approach is the starting point for our analysis. It is a relatively simple approach, commonly used by regulators, where the model produces a line of best fit to the data, so that around half the firms are above the modelled estimate of cost and half below. To this the lowest cost firm is then identified as the efficient frontier, and the line of best fit adjusted so that only one firm in on this line, and all others have higher costs. The distance of a particular firm from this line provides an estimate of its inefficiency. As this estimate includes both true inefficiencies, unobserved factors and any errors, it is likely to overstate efficiency gaps in general. As such we make an adjustment to the estimate to reflect these unobserved factors. Given that they are unobserved any adjustment is, to some extent, a matter of judgement. For this work we have reduced estimates by 25%.

Stochastic Frontier Modelling

8.497 This approach differs from COLS in that it attempts to separate out true efficiency from other random variations in efficiency (e.g. one-off natural events). It does so by fitting the model in a fairly similar way and then examining the differences between modelled and actual numbers. In a typical statistical analysis one might expect these differences (the residuals) to follow a normal distribution. But in efficiency modelling we may expect a skew, reflecting the fact that there will be a number of inefficient firms, but only one efficient one. The approach uses this skew to decompose this residual into true 'noise' and residual efficiency. Taking account of this noise in the model estimation in this way should, all else being equal, yield a more accurate estimate of inefficiency. As such this approach has generally been a focus of our analysis.

Data

8.498 Our analysis has focused on the Lasting Infrastructure Costs Benchmarking (LICB) dataset compiled by the International Union of Railways (UIC). There are currently 14 European rail infrastructure managers participating in this dataset, of which ten have been used in our analysis.[140] We are grateful to the UIC for providing us with access to their dataset, and to Network Rail for working constructively with us in its use. The

[140] These are Austria, Belgium, Finland, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom. Other countries have been excluded either due to non-comparability (e.g. non-similar operating or infrastructure conditions) or data limitations.

dataset covers the period 1996 to 2010, and Table 8.48 sets out the variables used from this dataset in our analysis.

Table 8.48: LICB dataset – variables used in analysis

Costs	Network size	Network usage	Network characteristics
Total maintenance and renewal costs	Track km	Passenger train km	Proportion of single track
Maintenance costs	Route km	Freight train km	Proportion of electrified track
Renewal costs	Single track km	Total train km	Passenger train density on network
	Electrified track km		Freight train density on network
			Total train density on network

8.499 In order to make the cost data comparable across countries we have made an adjustment to a common currency using GDP Purchasing Power Parity (PPP) exchange rates. We have also adjusted the data to constant prices. As such overall price differentials (such as wages) are taken into account at an economy wide rather than at a rail specific level. As a sensitivity test we have also adjusted using construction cost PPP, but do not consider this to be the best way of normalising the data. This is because it is not clear that a general construction industry correction factor is well-suited for specific track related renewals and maintenance, that the use of a narrower PPP definition necessarily increases data uncertainty, and the models are generally more unstable when construction PPP is used.

8.500 Following the analysis undertaken for PR08 a set of concerns have been raised regarding the quality of the LICB dataset. We have investigated these, and sought to develop our approach to overcome them as far as is possible. Table 8.49 lists the main concerns and the steps we have taken to investigate and address these.

Table 8.49: Concerns raised regarding the LICB dataset

Concern	Steps taken
Data anomalies where certain years' values are missing or volatile	We have conducted a detailed review of the LICB dataset using a number of different approaches to identify outlying observations. Where outliers have been identified and robust explanation has been provided, we have accepted this, otherwise where a clear data entry error has been made we have applied a correction. Where this has not been possible, or concerns on the overall integrity of the data remain, we have removed the relevant country entirely from our analysis. To account for any additional unidentified data uncertainty, we have also undertaken Monte-Carlo simulation where we have applied a 5% uncertainty factor to each observation in our dataset. The results of this indicate our efficiency results remain robust to this additional uncertainty.
Renewals expenditure may be classed as enhancements by other IMs	This should be more of a historic issue as revised definitions of maintenance and renewals (aimed specifically at achieving consistency) were agreed amongst the LICB participants in 2009. Additionally, we have used adjusted renewals data supplied by Network Rail in our analysis. This has retrospectively adjusted Network Rail's costs back to 2003 to match the revised definitions. We have also conducted additional analysis to accommodate the possibility of systematic misreporting: • our data integrity analysis has looked at maintenance renewal splits by country and these variables over time to try to detect and resolve any changes in behaviour, and cross-country outliers; and • we have looked at the effects of removing countries about which Network Rail have raised concerns on overall efficiency scores, in particular where those countries have set the frontier.

Concern	Steps taken
Some countries may not be renewing at 'steady state' rates	The average track reported renewal rate for countries in our dataset is 2.6%, which is higher than that stated by Network Rail in its CP4 track asset policy. Additionally, Switzerland, the Netherlands and Germany all report rates higher than this average. All else being equal countries with higher renewal rates should incur additional costs, and therefore be less likely to set the frontier. We do not have sufficient evidence available to make steady state adjustments for other countries, and view that making such adjustments across the board would introduce a significant degree of artificiality into the data. As such we have not made systematic adjustments for our analysis. Also: • we find that Network Rail's efficiency score is not generally being lowered by the presence of other countries in the dataset with lower than average rates of renewal. Our analysis shows that countries with low rates of renewal are not always setting the frontier – in other words, it does not appear that our models find those countries that are renewing less than average to be more efficient; • we have, in-line with our PR08 work, adjusted Network Rail's costs by the CP4 steady state rate of track renewal outlined in their track asset policy of 2.3%. This is to accommodate the shifts in renewals volumes experienced as a result of the transition from Railtrack to Network Rail; and • where clear evidence of change in renewals behaviour is evident in the dataset we have excluded the relevant country from the analysis.

8.501 Overall, we consider the LICB dataset to be of a sufficient quality to enable meaningful results to be drawn from analysis, and for this analysis to play a useful cross-check to other efficiency estimates included in this document.

Analysis

8.502 In undertaking our work we have tested a large variety of cost functions. Our preferred cost specification considers total maintenance and renewals expenditure as a function of track km, passenger train density, freight train density, the proportion of single track on the network, and time. This specification has been determined by economic and engineering analysis along with checks of parameter values and stability against a range of models. We have also tested additional variables to these but generally found them to be insignificant or inconsistent with theory.

8.503 We consider that these variables capture the most significant characteristics relevant for modelling, with for example the vast majority of the variation in costs in the data (over 80%) explained by the length of track alone. We have also tested alternative

econometric frameworks designed to take omitted variables into account but not found the results from these models to be credible. Further we have tested specific adjustments for omitted variables in our analysis, and found these to be insignificant in the models considered.

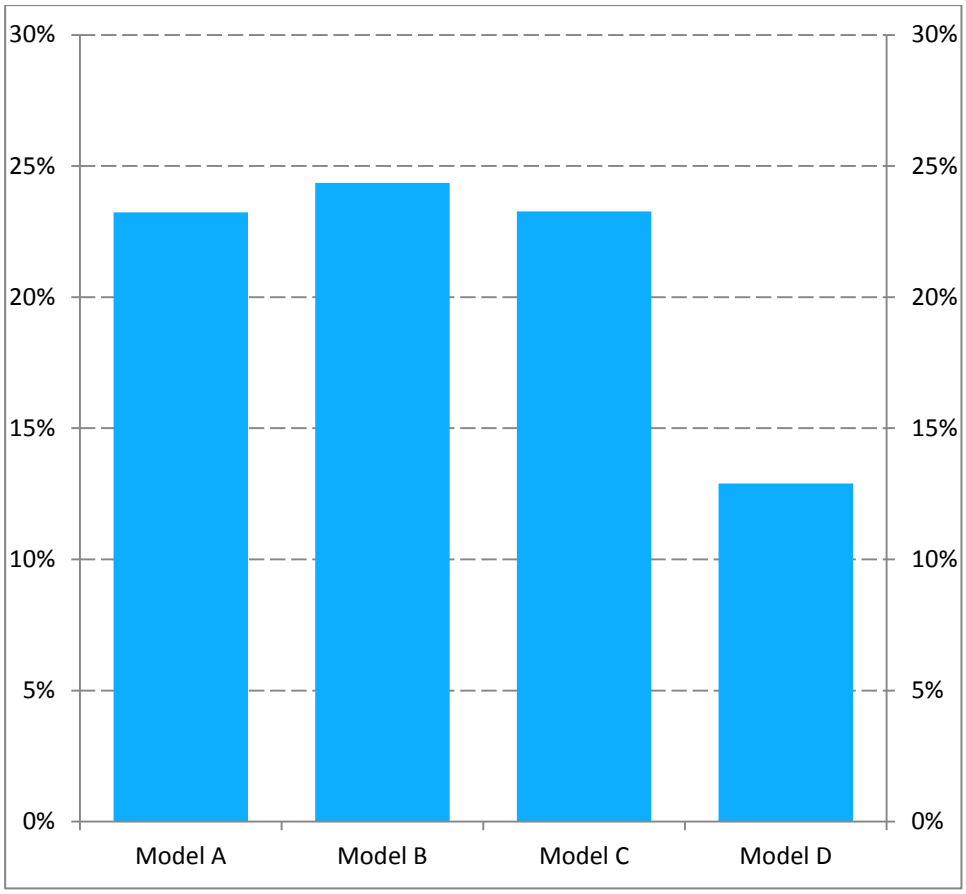
8.504 To this cost function we have then tested a wide set of efficiency models. We have tested our models for overall theoretical plausibility (so are the assumptions underpinning the model plausible), parameter plausibility (from an economic and engineering perspective), parameter stability (under the removal/addition of countries, years, or data perturbations), and finally plausibility of the efficiency estimates (so is there variation across countries and years, and does the spread look intuitively sensible).

8.505 Following this process there are four models which pass all of our tests. We consider all of these models to be sufficiently robust from an econometric and engineering perspective, and to provide a reasonable model of a reality which is fundamentally unknown. Rather than choosing one of these specifications as the 'preferred' approach, we instead accept there is inherent uncertainty as to the true model and have carried all of these models through to our results. As such we provide a range of inefficiency estimates for Network Rail. We view this approach as fairer and more transparent than selecting just one model.

Overall Results

8.506 Figure 8.17 below shows the results from each of the models we consider to be robust. This analysis produces a distribution of possible efficiency gaps for Network Rail in 2010 ranging from 13% to 24%. Looking at only the models that are not at the upper or lower end of this range would result in an efficiency gap estimate of 23%.

Figure 8.17: Estimates of Network Rail's efficiency gap with preferred models



9. Enhancements expenditure

Key messages in this chapter

- Enhancements are projects which improve the capacity or capability of the network, such as electrifying the Great Western Main Line or reinstating the line between Edinburgh and Tweedbank.
- The HLOSs set out a substantial programme of work, which was welcomed by the industry. Network Rail has set out its plans, which will bring major benefits for passengers and freight customers, including new journey opportunities, more frequent services and longer trains. It proposed 61 projects in England & Wales and 12 in Scotland, with a proposed cost of £12.4bn, including the ring-fenced funds. This compares to £9.3bn in the 2008 determination and £11.3bn of forecast spend[141] by Network Rail in CP4. Of this approximately 30% is for a major programme of electrification schemes. A further 25% is for Crossrail and Thameslink. 8% relate to two key major capacity and connectivity programmes (Northern Hub and East West Rail). The remaining Scottish projects add up to 8% and a further 11% is made up by a package of ring-fenced funds (six in England & Wales and five in Scotland).
- Of the £12.4bn there are about £3.3bn of costs for projects determined outside of the review (Thameslink, Crossrail, some EGIP elements and Borders) and £1.3bn of costs for ring-fenced funds. We scrutinised the remaining £7.8bn which we reduced to £7.2bn, largely as a result of applying Network Rail's own efficiency overlay to more projects where it was reasonable to do so and reducing risk allowances where we concluded that the levels were too high. Part of our assessment benchmarked costs, such as project management, which we compared with equivalent ones in global rail, water and aviation sectors.
- Whilst some of the SBP supporting documents were to a good standard, there was a lot of inconsistency in the quality and completeness of the information supplied which meant that more had to be provided later after we had started our assessment.

[141] Forecast spend is more than the 2008 determination because the governments have funded additional schemes since 2008 and there are other projects funded by third parties which were not part of the 2008 review.

Key messages in this chapter (continued)

- Many of the projects (approximately £7bn) are at an early stage of development. This meant that a determination of efficient cost was difficult due to the high allowances for risk and uncertainty inherent to projects at this stage. It also meant that Network Rail has not yet been able to involve train operators fully in some of the projects to make sure that scope is best value. Because of this we have decided to take a different approach to securing efficiency and value for money for these projects. We have included a provisional level of funding in the settlement, based on our current judgement. As costs become more certain and risk profiles more accurate Network Rail will resubmit these and we will review them again. As part of this process we expect Network Rail to demonstrate how it has worked closely with train operators and suppliers in defining project scope. We are allowing Network Rail to reach agreement with operators about sharing cost savings from their engagement in project development and delivery.
- The list of projects proposed by Network Rail meet the requirements of the HLOSs, although in Scotland there were two projects in the SBP, namely Carstairs journey time improvements and Edinburgh South Suburban electrification, that are not required by the Scottish HLOS. We have therefore not included them in our assumed level of expenditure, but this does not prevent either scheme being taken forward in CP5 should funding be identified.
- For other projects in Scotland we have already agreed the costs for Borders and some elements of the Edinburgh to Glasgow Improvement Programme (EGIP). For the remaining projects we have decided to treat them along similar lines to the projects in England & Wales, where we will undertake a further review when they have reached a more mature stage. The remaining elements of EGIP will be subject to bespoke target price arrangements, but all other projects will be included in the underspend/overspend framework (RAB roll forward policy) that we will continue in CP4 to incentivise efficient project delivery.
- Outputs of the programme will be published in the enhancements delivery plan (March 2014), with key milestones. These will be fixed around the timings of what Network Rail needs to do in delivering better service outputs for passengers and freight customers.

Key messages in this chapter (continued)

- The Strategic Freight Network has been widely supported in CP4 and is delivering infrastructure for more capacity and longer trains where it is needed. The fund will continue in England & Wales and a new fund will be created in Scotland.
- In this chapter we also set out the principles for how the ring-fenced funds (£1.3bn) will be governed and how we will ensure value for money. Generally, stakeholders have been well engaged in the management of CP4 funds through working groups. However governance arrangements have not always been sufficiently formalised, and passenger groups are not well represented. In some cases reporting at fund-level has not been sufficiently visible to stakeholders. We will make sure that in CP5 passenger and freight customer interests are clearly reflected in the governance of the funds and issues that matter to them are considered when schemes are selected.

Introduction

9.1 This chapter covers:

(a) a recap on the enhancements programmes announced in the two HLOSs;

(b) an overview of Network Rail's proposals, as set out in its SBP;

(c) an explanation of what decisions we make at this stage of the review, setting the context for our conclusions;

(d) the major issues we faced in assessing enhancements, such as deciding on efficient costs and the treatment of risk; and

(e) our conclusions on the enhancements portfolio and ring-fenced funds for Scotland and for England & Wales.

Enhancements in the HLOSs

England & Wales

9.2 The Secretary of State specified the increase in passenger capacity that should be delivered in CP5. This is defined in a capacity metric that identifies the additional number of passengers that should be accommodated on services into major cities[142]

[142] Birmingham, Manchester, Leeds, Bristol, Leicester, Liverpool, Newcastle, Nottingham, Sheffield

and the main London termini[143]. In addition to this specification the Secretary of State named a number of projects that the government wishes to see progressed. This included projects already under way (such as upgrading Birmingham New Street and Reading stations) and new projects such as the electric spine and electrification in South Wales.

9.3 The Secretary of State also made provision for six ring-fenced funds:

(a) £200m for a Strategic Rail Freight Network to fund improvements defined by the industry;

(b) £240m for East Coast Connectivity to improve capacity and reduce journey times on the East Coast Main Line;

(c) £300m for Passenger Journey Improvement to fund journey time and performance improvements;

(d) £200m for Station Improvement with up to half of this funding easier access for disabled passengers;

(e) £140m for Development to fund innovation and potential schemes for CP6; and

(f) £65m for Level Crossing Safety to reduce the risk of accidents at level crossings.

Scotland

9.4 The Scottish Ministers required Network Rail to deliver the following projects:

(a) Edinburgh to Glasgow Improvements Programme;

(b) Borders Railway;

(c) Aberdeen to Inverness Rail Line Improvements Phase 1;

(d) Highland Main Line Rail Improvements Phase 2;

(e) a rolling programme of electrification; and

(f) Motherwell signal box re-signalling and Motherwell Depot stabling.

9.5 They also established five ring-fenced funds:

(a) £30m for a Scottish Stations Fund to improve access to railway services;

[143] Blackfriars, Euston, Fenchurch Street, Kings Cross, Liverpool Street, London Bridge, Marylebone, Moorgate, Paddington, St. Pancras, Victoria, Waterloo

(b) £30m for a Scottish Strategic Rail Freight Investment Fund to encourage growth in rail freight and reduce emissions;

(c) £60m for a Scottish Network Improvement Fund developing the capacity and capability of general infrastructure and network communications systems;

(d) £10m for a Future Network Development Fund developing proposals for CP6 and beyond; and

(e) £10m for a Level Crossings Fund.

Network Rail's enhancements proposals – overview

9.6 Network Rail has developed a portfolio of enhancement projects to meet the requirements of the HLOSs.

9.7 As well as the main SBP documentation, Network Rail submitted a large amount of project-specific supporting information, including client briefs, feasibility reports, cost estimates, efficiency and risk methodologies and a summary of project costs.

9.8 Whilst some of the documents were to a good standard, there was a lot of inconsistency in the quality and completeness of the information supplied. There was also little in the way of whole life cost justification for the selected options. Of most concern to us was inconsistency between project estimates, engineering reports and costs included in the SBP which had to be supplemented by further information later after we had started our review.

9.9 There was a further challenge categorising project costs in a consistent manner, for example isolating direct costs (such as engineering works) and indirect costs (such as project management), and separating risk allowances from the cost estimate of the works. This was necessary so that we could analyse and benchmark costs across different projects; for example we found that the direct costs for some of the comparable electrification activities had a wide variation for what is standardised work.

England & Wales

9.10 The SBP set out a list of 61 projects and six funds with a proposed cost of around £11bn which Network Rail considered necessary to meet the HLOS. These have been categorised as: committed schemes; named schemes; HLOS capacity schemes; ring-fenced funds and others.

Table 9.1: Summary of Network Rail's proposed project costs by category

£bn 2012-13 prices	SBP
Committed Projects (e.g. Thameslink and Great Western electrification to Swansea)	6.2
Named Schemes (e.g. electric spine, links to airports and Waterloo station)	2.2
HLOS Capacity Metric (e.g. Chiltern platform lengthening)	0.9
Funds	1.2
Other projects (including the CP4 schemes continuing into CP5)	0.5
Total	11.0

9.11 Of the England & Wales total approximately 30% of costs are for Crossrail and Thameslink. A further 30% are for a major programme of electrification schemes (about 3% for electrification of the Welsh Valley Lines). 10% of costs relate to two key major programmes (Northern Hub and East West Rail) with a further 8% of costs made up by a large number of smaller capacity schemes that will ensure that the extra number of passengers expected to arrive at key stations around the country is met.

9.12 Network Rail develops projects through the Governance of Railway Investment Projects (GRIP) framework[144], which sets out various stages in a project lifecycle. Table 9.2 shows that there are a number of schemes at an early stage of development, with about two thirds having not yet completed the option selection stage.

9.13 Network Rail proposed in its SBP that the outputs and funding for some of these only be fixed once they reach a later stage when a single option has been selected. This was the main issue we faced in determining efficient costs and is explained more fully in the section 'major issues in assessing enhancements'.

[144] http://www.networkrail.co.uk/aspx/4171.aspx.

Table 9.2: Stage of Network Rail's project development at the time of the SBP

Stage of project development	SBP value £bn (2012-13 prices)	Number of projects
Output undefined – GRIP 0	1.8	15
Output definition – GRIP 1	0.5	11
Pre-feasibility – GRIP 2	2.7	17
Option selection – GRIP 3	0.3	5
Single option development – GRIP 4	0.1	2
Construction, testing and commissioning – GRIP 5	0.3	6
Programmes (Crossrail, Thameslink, Northern Hub and IEP)	4.0	5
Ring-fenced funds (SFN, etc.)	1.2	6
Total	11.0	67

9.14 The list of SBP projects was derived from modelling the effects of different options on the capacity metrics. The 'committed' and 'named' schemes were expected to deliver around 90% of the HLOS capacity metrics. The SBP proposed a further 27 projects costing about £900m to deliver the full metrics. These were informed by the route utilisation strategies[145], which had involved cross industry involvement and wider stakeholder consultation. The portfolio of proposed projects was broadly similar to DfT's illustrative option (which was the list of schemes published by DfT alongside the HLOS and indicated what package would likely meet the capacity metrics).

9.15 There are a number of schemes not required by the HLOS that were included in the IIP. They have not been included in the SBP, but Network Rail and industry partners may continue to explore potential funding sources for them outside of this review, through for example the ring-fenced funds or investment framework.

9.16 The CP5 plans have a total value of around £11bn, compared with about £8.8bn in the 2008 determination (2012-13 prices). On balance Network Rail has a good track record of delivering enhancements in CP4. The redevelopment of Kings Cross station opened on time. Platform lengthening schemes in both the midlands and south east

[145] http://www.networkrail.co.uk/aspx/4449.aspx.

were ready in time for longer trains to run. The second phase of the Thameslink programme allowing more trains to run between St Pancras and Blackfriars and longer trains to run between Bedford and Brighton was completed on schedule.

9.17 In relation to the projects set out in the 2008 determination there have been significant changes during the control period. Some projects have redefined scope or been deferred because less rolling stock has been introduced than originally planned, resulting in about £2bn[146] of reduced spend. About two thirds of this is because the scope of CP4 work for Thameslink, Stafford area improvements and Werrington junction changed which we approved through the change control mechanism[147]. However, this does not reflect the full picture in CP4 because the Secretary of State has announced further schemes since 2008, such as the electrification programmes on the Great Western Main Line and in the north west. Taking these into account Network Rail is expected to spend close to £9bn[148] on government funded enhancements in CP4.

Scotland

9.18 The SBP set out a list of 12 projects and five funds with a total cost of around £1.4bn required to meet the Scottish Ministers' HLOS. Table 9.3 outlines these projects and their stage of development. EGIP is a programme that has individual projects at varying GRIP stages. Some works for Borders have already started on the ground but other elements are still in the planning phase.

Table 9.3: Project costs in the Scotland SBP

Projects and funds (2012-13 prices)	SBP (£m)	GRIP stage
Committed projects		
EGIP Electrification (Springburn to Cumbernauld)	26	4
EGIP Electrification (Glasgow to Edinburgh via Falkirk High)	124	3
EGIP (Edinburgh Gateway Station)	31	3
EGIP Infrastructure works	308	1

[146] Reported in Network Rail's period 13 finance pack.

[147] http://www.rail-reg.gov.uk/server/show/nav.2177

[148] Reported in Appendix 24 of the SBP databook which updates actual and forecast expenditure for CP4 and replaces the 2013 delivery plan update.

Projects and funds (2012-13 prices)	SBP (£m)	GRIP stage
Borders Railway	124	6
Total committed projects	**613**	
Other Scottish projects		
Aberdeen to Inverness improvements Phase 1	280	0
Highland Main Line journey time improvements Phase 2	121	0
Rolling programme of electrification	171	3
Motherwell re-signalling enhancements	3*	0
Motherwell area stabling	10	0
Other projects to meet the outputs	80	0
Total other Scottish projects	**665**	
Funds to deliver specific outcomes		
Scottish stations fund	31	n/a
Scottish strategic rail freight investment fund	31	n/a
Scottish network improvement fund	62	n/a
Future network development fund	10.5	n/a
Level crossings fund	10.5	n/a
Total funds to deliver specific outcomes	**145**	
Total	**1423**	

***** the supporting information provided with the SBP adjusted this from £11m included in the published SBP.

9.19 About 40% of the costs are for the committed projects: increased capacity and faster services between Edinburgh and Glasgow; and the new Borders railway line linking Midlothian and Scottish Borders.

9.20 Network Rail's plans have a total value of around £1.4bn, compared with about £465m[149] in the 2008 determination (2012-13 prices). Since 2008 Transport Scotland

[149] Reported in Appendix 24 of the SBP databook which updates actual and forecast expenditure for CP4 and replaces the 2013 delivery plan update.

has announced a further £518m[150] (2012-13 prices) for EGIP and Borders bringing total CP4 expenditure to about £1bn. Whilst a significant amount will be spent over the next year on EGIP and Borders a number of large projects have already been delivered in CP4, including: a new electrified railway between Airdrie and Bathgate; improvements to the Paisley corridor allowing more frequent and reliable services between Glasgow and Ayrshire.

What we decide in our determination

9.21 This section sets out what aspects of the enhancements portfolio we decide in the periodic review, providing the context for our conclusions.

Outputs

9.22 We said in our outputs consultation[151] that we intended to continue to have milestones for enhancements in Network Rail's delivery plan and to have a change control mechanism. Both these approaches worked well in CP4 and are widely supported. Setting out when it will deliver each stage of a project, and keeping this updated, is useful information for stakeholders and customers. We will use these milestones to monitor whether Network Rail is on course to deliver each project. We will categorise some of the milestones as 'outputs', which means that they will be subject to regulatory enforcement if they are missed or likely to be missed (a further explanation of outputs is set out in chapter 3).

9.23 Although the outcomes of delivering enhancements are not specifically picked up in the National Passenger Survey they can be one of the biggest drivers of customer satisfaction in specific locations or on specific routes where benefits are delivered. Therefore, we will make sure that regulated outputs are based on the timing of the delivery of passenger and freight customer benefits, as this is what matters to customers. These will be finalised in the enhancements delivery plan, which will be published by Network Rail and agreed by us before the start of the control period. A draft will be published in December 2013 and open to wider consultation before being finalised by March 2014. In this way the delivery milestones will reflect stakeholder input, and the main issue here is likely to be ensuring a match between service level

[150] Reported in Appendix 24 of the SBP databook which updates actual and forecast expenditure for CP4 and replaces the 2013 delivery plan update.

[151] http://www.rail-reg.gov.uk/pr13/consultations/outputs.php

changes operators are trying to deliver and Network Rail's infrastructure changes. For example, recognising the difference between Network Rail's obligations and those of other industry partners, matching up the delivery of longer platforms to when longer trains are timetabled to be introduced.

9.24 For projects at an early stage of development the regulated outputs in the March 2014 delivery plan will be to achieve GRIP 3. After that they will be changed to the delivery milestones, when these are further defined.

Efficient costs to be added to the RAB

9.25 Although we do not take decisions on milestones in the determination we have to estimate what level of efficient costs should be added to the RAB, so that Network Rail's revenue requirement can be calculated and access charges set. Key to this is how we treat risk because there is significant risk provision included for many projects that are still at an early stage of development.

9.26 First of all we checked that the proposed projects are required to meet the HLOSs. In England & Wales we verified whether the projects over and above the committed and named schemes are necessary to deliver the capacity metrics.

9.27 We then checked the costs of delivering both the individual projects and the wider portfolio.

9.28 Finally we decided how to incentivise Network Rail to outperform our determination and, alongside this, how to incentivise cross industry working with train operators and the supply chain so that project scope is optimised for best value before the detailed design stage. In CP4 Network Rail has started to engage earlier with the supply chain and employ a radically different relationship through project alliances. We support this initiative and have made sure that we do not prejudice any such commercial arrangements.

Governance of the ring-fenced funds

9.29 The governance arrangements for the ring-fenced funds, including how value for money will be assured, will be finalised in the enhancements delivery plan. However, we have set out in this determination the principles that they must meet.

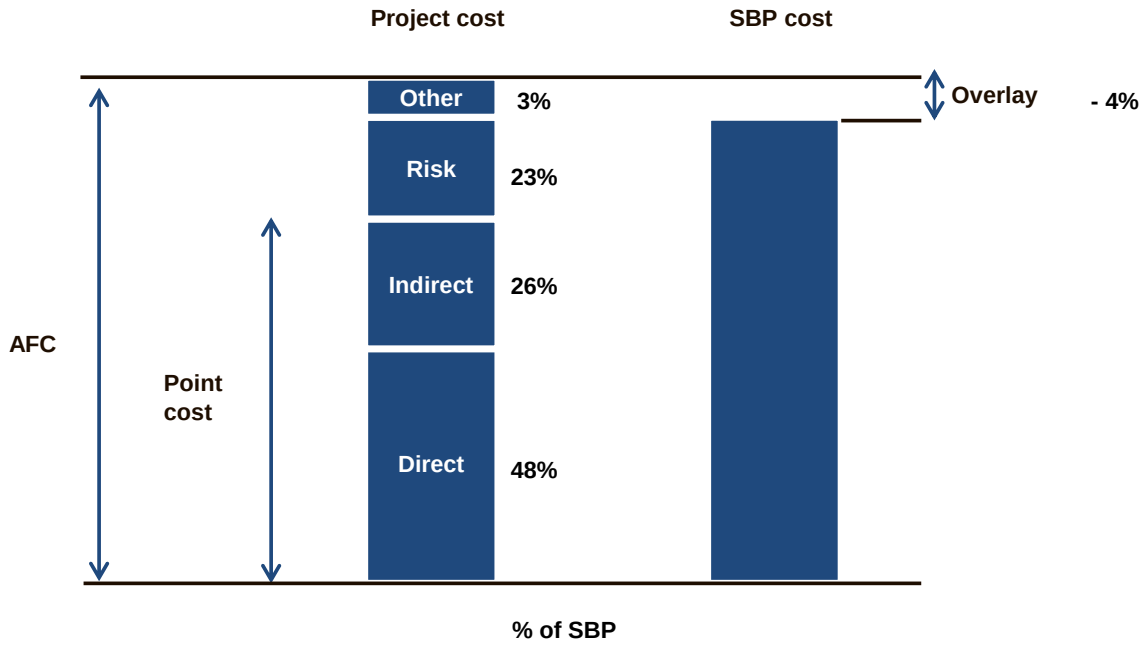
Major issues in assessing enhancements

9.30 Here we set out the major issues we considered in reaching our decisions.

Determining efficient costs

9.31 Determining efficient costs for an enhancement project differs from other areas of expenditure, such as renewals. By their nature enhancements often involve bespoke solutions involving a range of different types of work. For example, an electrification scheme may need to reconstruct a number of bridges as well as erecting overhead wires. This means that, unlike renewals, costing the work is project specific and is not generally based on repeatable work items. Network Rail has built up a cost estimate for each project and applied an efficiency overlay, based on: its own benchmarks; the effects of changes to its project delivery process; and improvements to how it manages its supply chain. It also made some adjustments to take account of risk reduction from delivering a large portfolio of work. This build-up of Network Rail's cost estimates is illustrated in Figure 9.1.

Figure 9.1: Network Rail's build-up of a project cost estimate



9.32 Network Rail's internal benchmarking of unit rates was based on data collected from CP4 projects, but coverage was low in terms of comparable work and the rates only apply to direct costs, such as construction. In addition, Network Rail did not manage

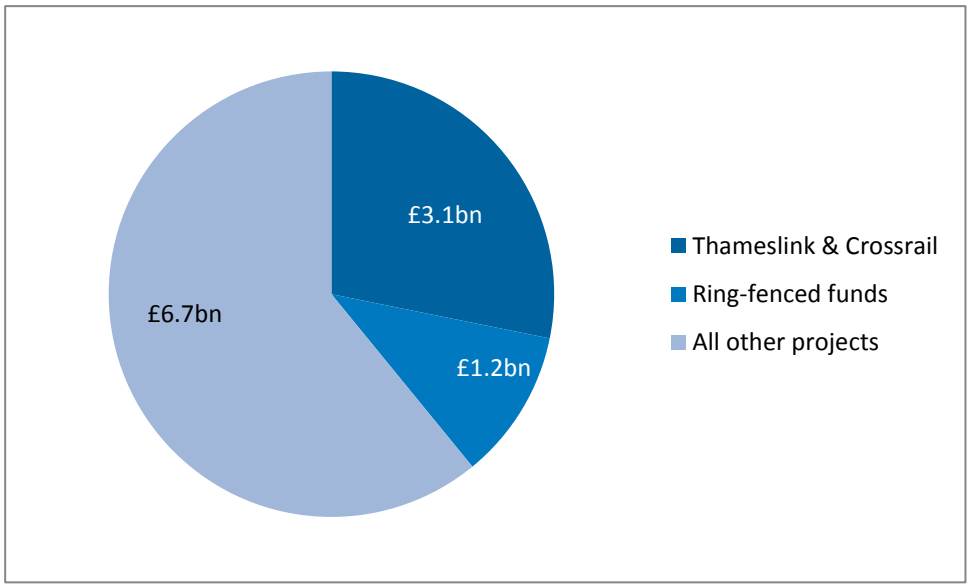
to collect any good quantitative external benchmarking information. We therefore decided to extend the use of benchmarking in our own assessment, particularly to understand indirect costs, such as design or project management, and risk provisions.

9.33 While the total spend on enhancements proposed in the SBP is £11bn for England & Wales, our determination of efficient cost applies to £6.7bn because:

(a) Thameslink and Crossrail total £3.1bn; the costs for these have already been agreed between Network Rail and DfT and both projects are governed by protocols with a pain/gain share mechanism to incentivise efficient delivery; specific contractual arrangements are already in place and we have agreed not to duplicate or cut across these; and

(b) the funds account for £1.2bn. This is a capped amount and we will determine the efficient spend and value for money in the funds during the control period.

Figure 9.2: Network Rail's breakdown of projects in England & Wales

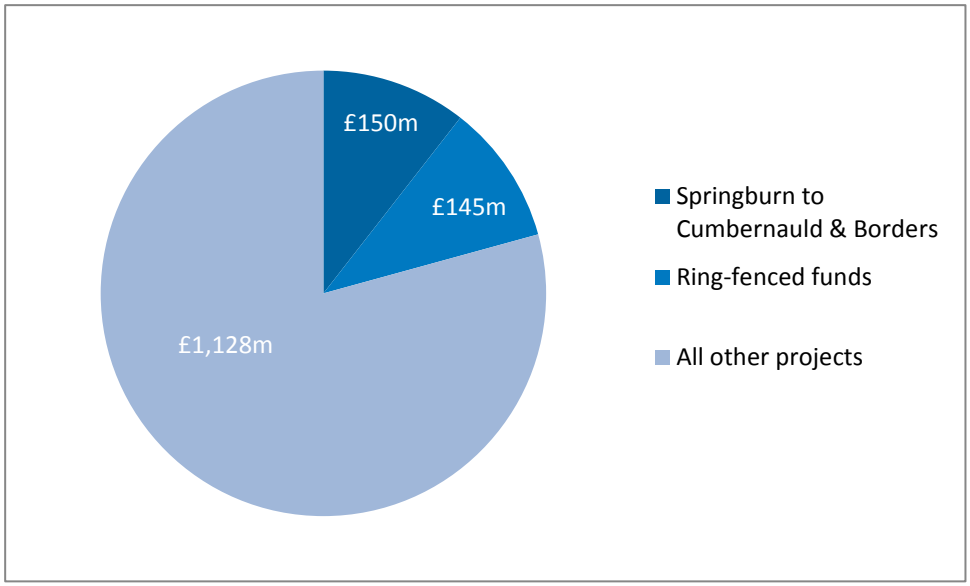


9.34 In Scotland, of the £1.4bn proposed in the SBP:

(a) we have already assessed the Springburn to Cumbernauld and Borders projects through the investment framework (combined total of £150m) and these are subject to target price arrangements with Transport Scotland with their own pain/gain share mechanisms; and

(b) the ring-fenced funds amount to £145m. This is a capped amount and we will determine efficient spend and value for money during the control period.

Figure 9.3: Network Rail's breakdown of projects in Scotland



Project scope and costs

9.35 We carried out a review of efficient project costs informed by two studies: Arup[152] provided advice on whether the projects were required to meet the England & Wales HLOS metrics; a consortium of Nichols/Turner & Townsend/URS[153] scrutinised the scope and cost estimates of about £7.2bn worth of the projects in England & Wales and Scotland.

Arup review: Check of Network Rail's HLOS capacity metrics for CP4 and CP5

9.36 Arup undertook a detailed review and validation of the model used by Network Rail to define which projects are needed to meet the HLOS requirements. This was supplemented by a cross check with Network Rail's route planners on the inputs to the modelling.

9.37 The team also checked on the level of operator involvement, either through the RUSs or subsequent industry consultation, which can indicate whether the projects that had been proposed in the SBP to deliver the capacity metrics had originated from the RUSs and therefore had good business cases with stakeholder support.

[152] http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

[153] http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php.

Nichols consortium review: Review of Network Rail's SBP infrastructure enhancement proposals for CP5

9.38 Thameslink and Crossrail were excluded from this work. Other elements out of scope were the ring-fenced funds and projects where our own staff were better placed because of the work we have done in CP4, these are the schemes from CP4 rolling over into CP5, EGIP and Borders.

9.39 Because Network Rail's own benchmarking was insufficient we included in the Nichols consortium's work a remit to draw out any comparisons they had in global rail, water and aviation sectors.

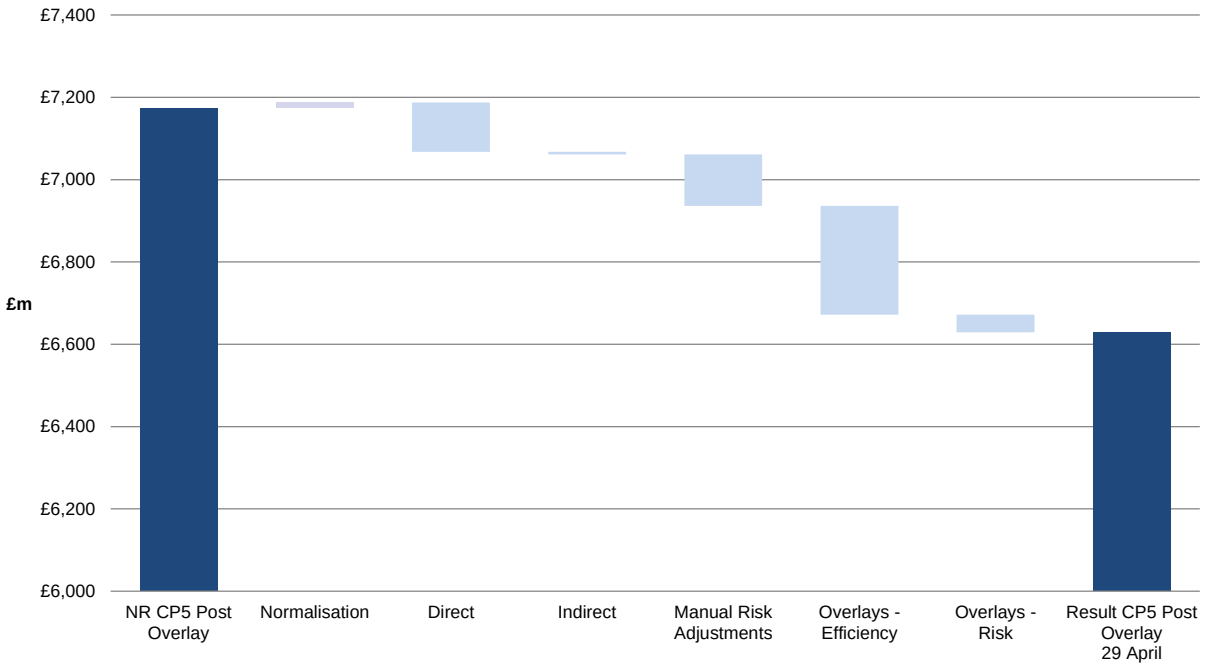
9.40 The consortium structured their review around a seven step process as shown in the figure below.

Figure 9.4: Nichols consortium review methodology

9.41 Of the projects they were able to analyse both upward and downward adjustments were made to correct any omissions and ensure estimates were in the right price base. For electrification and power supply schemes the consortium benchmarked direct costs across the CP5 projects. For indirect costs they used their own benchmarking data to check whether those proposed for each project were in line with expected norms. The consortium then looked at both the individual project risk allowances and overall risk portfolio overlay. Finally they assessed Network Rail's

efficiency proposals and applied it to a greater number of projects. Their adjustments are summarised in the following charts.

Figure 9.5: Overview of cost adjustments from Nichols consortium review



Adjustment type	(£m)	Description
Normalisation	+14	Changes in figures required to align Electric Spine project costs with the DfT forecast, adjustments resulting from reconciliation issues between the Network Rail estimates provided and their SBP submission, and changes required to harmonise the cost base to 4Q12
Direct	-120	A net reduction resulting from proposed adjustments to direct costs including their commensurate indirect and risk uplifts
Indirect	-6	A small reduction resulting from proposed adjustments to indirect costs based on comparisons with accepted norms
Manual Risk Adjustment	-125	Proposed reductions to specific project risk and contingency provisions
Overlays – Efficiency	-265	A net reduction resulting from the proposed changes to Network Rail's efficiency overlay, and to apply this to additional SBP projects
Overlays – Risk	-43	A reduction in relation to Network Rail's portfolio risk overlay, including changes to both the rate applied and the projects impacted
Total	**-545 (m)**	

9.42 We checked the Nichols consortium's work against an in-house review of a sample of projects, which was based on our own experience and analysis of CP4 projects added to the RAB through the investment framework, which is the mechanism that allows stakeholders to fund investment in between periodic reviews. Further information on the investment framework can be found on our website[154].

Frontier shift

9.43 In addition to the individual project reviews we commissioned CEPA[155] to build upon its analysis of frontier shift for other areas of expenditure and advise how this could be applied to the enhancements portfolio. They concluded a median case of 0.4% per annum savings for enhancements.

Treatment of projects at an early development stage

9.44 A further complication in determining efficient costs is the uplifted levels of risk and uncertainty inherent in projects at an early stage of development. An equally important issue for these projects is that Network Rail has not yet been able to fully engage with train operators in developing scope and selecting the best option. It is widely recognised that decisions made at an early stage of a project have the biggest influence on outturn costs. This was well illustrated in the Rail Value for Money Study[156]. It is therefore extremely important for train operators to be involved at early stages so that the best whole industry scope is developed that delivers the required operational benefits.

England & Wales

9.45 Of the £6.7bn costs that we examined there is about £6bn based on an indicative definition of scope and risks, i.e. a single option has not yet been developed. Of this broadly £1.5bn[157] is allocated for risk. So much risk provision makes determining efficient costs more difficult and weakens outperformance incentives.

9.46 In the SBP Network Rail proposed that about £2.3bn worth of these projects should be treated differently. It proposed that our final determination should include provisional estimated costs (which for some projects include a 60% uplift for

[154] http://www.rail-reg.gov.uk/upload/pdf/investment_framework_guidelines_october_2010.pdf

[155] http://www.rail-reg.gov.uk/pr13/publications/consultants-reports.php

[156] http://www.rail-reg.gov.uk/upload/pdf/rvfm-atkins-programme-management-250511.pdf

[157] Calculated by applying the average risk allowance (25%) to £6bn.

uncertainty). Once the schemes are more developed and have cost probability distributions Network Rail will develop a portfolio cost estimate. ORR would review this and agree an efficient cost. The difference between this portfolio cost and the provisional estimate would then be adjusted for through the RAB or the opex memorandum account, as appropriate, at the start of CP6. The projects proposed for this treatment included Electric Spine, East-West Rail, Waterloo and traction power upgrades.

9.47 We asked Network Rail to explain why so many projects were at an early stage of development given that it expects to spend £91m[158] in CP4 on developing schemes for CP5. Most are schemes which DfT included in its HLOS and were based on limited development work, so the outputs are not yet sufficiently defined. In these cases we believe it is unreasonable that Network Rail should be penalised. Other projects are at an early stage of development because Network Rail thought they would not be needed for the HLOS, or the development work needed to be sequential to other CP5 projects (e.g. power supply upgrades). The targeting of development funding in future control period needs to be better than in CP4, with closer working across the industry with funders.

9.48 Even with the proposed treatment of the £2.3bn schemes there is too much uncertainty in the remaining £4.3bn; which would still contain around 20-30% risk uplift from the base estimate. The cost uncertainty also means that an efficient cost determination on a £4.3bn portfolio would be difficult because it would include around £1bn[159] of risk provision and the 'accuracy' of an efficient cost determination would be reduced.

9.49 We have, therefore, decided to treat all projects where we set an efficient cost (the £6.7bn portfolio) differently from PR08 and review costs for these later in the control period when they are more certain. This will allow:

(a) better targeting and setting of efficient costs for the bulk of CP5; and

(b) opportunities to achieve better value for money through deeper engagement of TOCs and FOCs so that we have greater certainty that the right projects are

[158] Reported in Appendix 24 of the SBP databook which updates actual and forecast expenditure for CP4 and replaces the 2013 delivery plan update.

[159] Calculated by applying an average risk allowance (25%) to £4.3bn.

scoped to achieve the best customer benefits within the framework of long-term sustainable asset policies.

9.50 Appropriate governance has to be put in place involving the TOCs and FOCs to ensure the right projects are selected and scope is sufficiently developed and ensure train operators are engaged as early as possible so that project scope is optimised for best value before the detail design and delivery stages.

Scotland

9.51 Similarly in Scotland, of the £1.1bn of costs we reviewed, around £800m[160] is based on an indicative definition of scope and risk. In its SBP Network Rail proposed that the following three schemes should be assessed at a later date in the same way as its proposal for England & Wales, due to the low level of certainty in their cost estimates:

(a) Aberdeen to Inverness Improvements Phase 1;

(b) Highland Main Line Journey Time Improvements Phase 2; and

(c) EGIP – Infrastructure works.

9.52 We think there are high levels of uncertainty in the remaining projects, for example in the phasing of the rolling programme of electrification and the proposed solution for the Edinburgh gateway station. As in England & Wales we have therefore decided to treat all projects where we set an efficient cost (the £1.1bn portfolio) differently from PR08 and review costs for these later in the control period when they are more certain.

9.53 Network Rail is developing proposals for an alliance with the next ScotRail operator, with the new franchise due to start in April 2015. This provides clear opportunities for Network Rail to make sure appropriate governance is in place to work closely together on defining the right scope for the projects. However, this should not exclude working with other TOCs and FOCs operating in Scotland.

Process for determining efficient costs in England & Wales and Scotland

9.54 We are therefore determining the efficient cost and outputs in two steps. The first concludes with our final determination, where we include in our assumptions an efficient level of costs and outputs based on our assessment of the information provided with the SBP. This incorporated the review done for us by the Nichols

[160] The sum of all projects that are GRIP 0 to GRIP 2.

consortium. We have made adjustments to ensure the funding allocation is appropriate for the stage of project development. We made an efficiency overlay that is commensurate with a portfolio that is largely at an early stage. This has been used in calculating the revenue requirement and access charges.

9.55 However, we have decided that a second step is needed which will conclude at the end of year 1 of CP5, i.e. by March 2015, at which point project development will be more advanced, and therefore the cost certainty will be higher. This will mean that we can determine more 'accurate' costs to be added to the RAB. It will also mean that the baseline for the underspend/overspend framework (RAB roll forward policy) to incentivise outperformance will be strengthened.

9.56 We expect Network Rail to have reached GRIP 3 for the majority of projects by this time (March 2015), with a much greater degree of operator involvement. During the development work, as more projects reach GRIP 3 we will monitor the emerging costs at portfolio level as well as project level. We will challenge projects, particularly where costs escalate above the assumed funding in the final determination.

9.57 Network Rail will make a submission to ORR in line with the principles of the investment framework at GRIP 3 (or agreed alternative) and we will then decide what costs should be the baseline for the underspend/overspend framework (RAB roll forward policy). The submission will demonstrate:

(a) the output is consistent with the HLOS, verified by the HLOS capacity model where necessary, and the business case is value for money;

(b) evidence of operator buy-in to the selected option (e.g. through any benefits sharing agreement);

(c) a delivery plan change control submission to set out project milestones;

(d) evidence of efficiency or stretch within the anticipated final cost; and

(e) evidence that the selected option is the best whole life cost solution.

9.58 We do not expect the aggregate costs to exceed the amount we have set in the determination, but if it does then we will discuss the implications with the funders before reaching our final decision.

9.59 As in CP4 we will then assess Network Rail's performance against the baseline for the underspend/overspend framework (RAB roll forward policy).

9.60 We believe there are opportunities through closer working with train operators to reduce unnecessary scope in the design stages and deliver construction work in a more cost-effective way. In December 2012 we published our decisions on route-level efficiency benefits sharing (REBS), which excluded enhancements as we concluded that these are more suitable for bespoke alliancing arrangements[161]. We want Network Rail and train operators to enter into commercial agreements that will reward operators if cost savings are achieved as a result of their involvement. We will consider any such payment efficient where Network Rail and train operators can demonstrate that this has happened, including how long-term value has not been compromised by short-term reward. We believe that this will help Network Rail and train operators to focus enhancements on delivering best value for money for the railway's customers. We also believe this will help Network Rail out-perform the settlement and it does not require any changes to the regulatory framework.

9.61 We will agree the detailed process with Network Rail between now and the final determination but there should be no delays to the CP5 programme. Some pilot projects have already begun.

Incentivising efficient delivery

9.62 How Network Rail is incentivised to outperform efficient project delivery is explained in chapter 12 where we explain how the underspend/overspend framework (RAB roll forward policy) will apply to enhancements in CP5.

9.63 Specifically in Scotland we have agreed with Network Rail's proposal that the other elements of EGIP should be considered as a bespoke target price arrangement (set at the beginning of the programme, with agreed pain/gain incentives). This relates to the following three projects in the SBP:

(a) electrification of Glasgow to Edinburgh via Falkirk High;

(b) Edinburgh Gateway Station; and

(c) infrastructure works.

9.64 All other enhancement projects in Scotland (except for Borders) are subject to the underspend/overspend framework (RAB roll forward policy).

[161] http://www.rail-reg.gov.uk/pr13/PDF/aligning-incentives-decisions-dec12.pdf

RAB roll forward policy

9.65 We set out earlier in this chapter a new process for determining efficient costs for some of the enhancements in England & Wales and Scotland that takes account of the early stage of development of a large number of projects submitted in the SBP. This section describes how the framework for incentivising outperformance will work.

9.66 The underspend/overspend framework for enhancements will operate as in CP4. The key difference is that the PR13 determination for enhancement costs will not be the baseline for the framework. Instead it will be set at the end of 2014-15 following our second review of the portfolio costs. It will be this expenditure level that Network Rail will be incentivised to outperform. This will also be used as the base in our assessment of Network Rail's financial performance.

9.67 Any differences between the final determination and the baseline we will treat as a change to outputs and make a financial adjustment at the end of the control period to make the re-setting of the baseline financially neutral.

9.68 The logging up of enhancements underspend and overspend will be on the following basis:

(a) it will not apply to Crossrail and Thameslink (where there are tailored protocols in place) or EGIP and Borders (where there will be target price arrangements put in place), as these projects have their own pain/gain share mechanism;

(b) it will not apply to the ring-fenced funds;

(c) for all other enhancement projects (including the Welsh Valley Lines electrification) where Network Rail underspends efficiently, i.e. it underspends whilst delivering the required outputs in full, it will retain the benefit of that outperformance for five years. We will reflect this through an adjustment of the RAB at the beginning of CP6. We will calculate the amount to be deducted as the amount of underspend less 25%. Where Network Rail has underspent due to a failure to deliver required outputs we will reduce the RAB to reflect this but it will not retain 25% of the underspend. Failure to deliver required outputs may also result in us taking enforcement action in line with our published policy.

(d) in England & Wales, we will log-up 75% of any aggregate overspend subject to any manifestly inefficient overspend being disallowed; and

(e) in Scotland, we will undertake a specific ex post efficiency assessment on the projects covered by the framework.

9.69 For the relevant projects we will apply the framework on the aggregate spend, which means Network Rail is free to budget for individual schemes as it sees fit.

Our conclusions

9.70 In this section we set out our conclusions on whether the projects meet the requirements of the HLOSs; what level of efficient cost is assumed for the revenue requirement; and what governance arrangements we want for the ring-fenced funds.

England & Wales

HLOS capacity metric requirements

9.71 The Arup review concluded that the model used was fit for purpose. The capacity interventions proposed in the SBP will accommodate the forecast peak growth in the HLOS. Despite high levels of passenger growth overcrowding at the end of CP5 will be significantly reduced in some areas (notably in Manchester and at some London terminals).

9.72 From their findings we have drawn the following conclusions:

(a) most model inputs were based on projects that originated through the RUS planning process and hence have had a high degree of consultation with industry parties, such as train operators and passenger groups, and wider stakeholders, such as local authorities;

(b) in general the RUS process identified the projects with the strongest business cases, and it is a selection of these projects which were included in the IIP, HLOS and SBP; and

(c) for each terminal station Network Rail had attempted to spread the interventions across the different routes feeding the station. This was evidenced further by meetings with the Network Rail strategic planners and a specific examination on Leeds and Manchester radial routes.

9.73 During our SBP consultation, we received many responses from stakeholders proposing schemes that they considered should be in the SBP but had been omitted. In the light of the Arup findings, we have concluded that these would deliver over and

above what is required by the HLOS capacity metrics and we have not included them in the determination.

9.74 However, these could be candidate schemes for the ring-fenced funds which will prioritise highest value for money projects.

9.75 Because we have created a new process for Network Rail to engage more fully with operators, there is plenty of opportunity for them to influence the scope of work in the planning phases and propose better value for money solutions.

Review of enhancement projects

Overview

9.76 Table 9.4 shows a breakdown of our assumed costs for projects in England & Wales. This was mainly informed by the Nichols consortium review but it also includes some other adjustments we made. The remainder of this section summarises our conclusions on each category of projects in the table.

Table 9.4: Overview of our assumptions on project costs in England & Wales

£bn (2012-13 prices)	SBP	ORR determination	Difference
Thameslink & Crossrail	3.1	3.1	0
Ring-fenced funds	1.2	1.2	0
Electrification schemes	3.2	3.0	-0.2
Other committed schemes	1.7	1.5	-0.2
Other named schemes & CP4 rollover	0.9	0.8	-0.1
HLOS capacity metric schemes	0.9	0.7	-0.2
Overlay for other adjustments	-	0.5	+0.5
Total	**11.0**	**10.8**	**-0.2**

Thameslink and Crossrail

9.77 Both of these projects will deliver significant benefits to passengers traveling across London. We have confirmed that the costs in the settlement are consistent with those agreed with DfT and Crossrail Ltd. In CP5 we will continue to operate under the protocols for these projects, where we recognise that there are specific arrangements to incentivise Network Rail.

Ring-fenced funds

9.78 We made no adjustments as the amounts were specified in the HLOSs. The final section of this chapter deals with other issues relating to these types of funds.

Electrification schemes

9.79 The Nichols consortium did a detailed assessment of the electrification schemes and costs contained within the SBP. Aside from Thameslink and Crossrail, the electrification portfolio is the largest group of projects in the SBP. It is dominated by; Great Western Main Line, Midland Main Line, North West, Transpennine and Welsh Valley Lines.

9.80 Electrifying the railway will bring many benefits for both passengers and freight users, most notably the ability to run more frequent trains with shorter journey times and less environmental impact, such as noise and diesel fumes.

9.81 There are a number of other related projects in the SBP, such as IEP, gauge clearance, power enhancement and station/platform schemes, which represents a complex picture, with a significant number of interfaces between projects.

9.82 The Electric Spine is a new programme announced by DfT, which Network Rail has identified as having uncertain scope and outputs at the time of the SBP submission. However, it does include the Midland Main Line (MML) electrification and remodelling of Derby station, both of which are further developed than the remaining programme. In its SBP, Network Rail proposed completion of the MML electrification in early CP6. In the consultation responses there was strong stakeholder challenge to accelerate this so that full electrification to Sheffield is achieved in CP5.

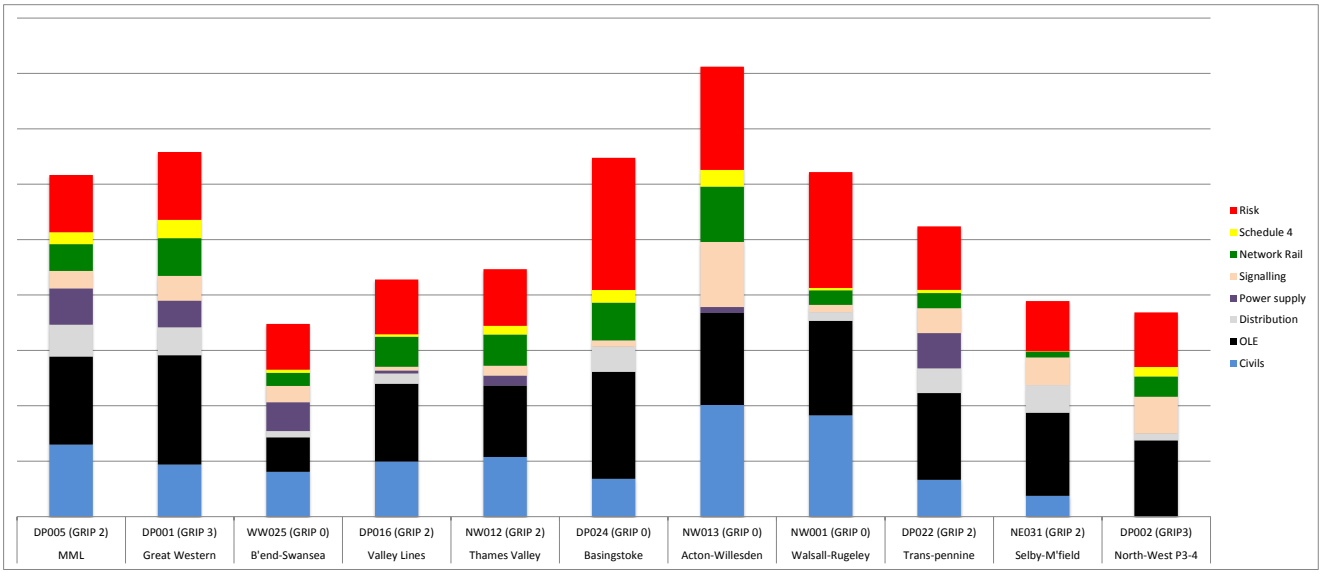
9.83 Given that the MML electrification is further developed than other elements and has very strong operator support, we expect that there is opportunity to re-prioritise the roll-out of the programme, for example by bringing electrification to Sheffield into CP5.

9.84 We have set an assumed level of funding for the Electric Spine programme – including MML electrification and Derby station. It is now for Network Rail and operators to urgently progress the design and development work of the whole portfolio to define the best value outputs in CP5 within the allocated expenditure, taking into account rolling stock availability, schedule risks and efficient delivery in the context of a large amount of other electrification work in CP5.

9.85 Given the low level of maturity of the majority of Electric Spine schemes, we have also re-profiled the spend within CP5 assuming that there will be a 2 year development and design period before implementation gathers pace. As mentioned earlier we need to make sure that infrastructure delivery is aligned with the introduction of new or cascaded trains and we will do this as we finalise the enhancements delivery plan.

9.86 The Nichols consortium produced some comparative analysis of the schemes which is summarised in the following charts.

Figure 9.6: Electrification comparisons from Nichols consortium review (the unit rates have been redacted)



Other committed schemes

9.87 The **Northern Hub** is the largest project in this category. The outputs of this project will enable more frequent train services, faster journey times and new connections across the Pennines plus additional journey opportunities to Manchester airport. The project is designed to support economic growth and has had extensive input from a range of stakeholders. Work started in CP4 and will extend into CP5 to include capacity works in the Castleford corridor, new platforms at Manchester Piccadilly and capacity improvements between Manchester, Liverpool, Rochdale, Sheffield and Chester. The Nichols consortium review found that some conservative assumptions had been made on scope and risk and that no efficiency overlay had been applied which we have adjusted accordingly.

9.88 The **Intercity Express Programme** (IEP) is a package of gauge, track and platform enhancements on the East Coast and Great Western main lines. The works will enable deployment of super express trains in CP5. The first units to be built will be introduced into service on the Great Western Main Line from 2017 and on the East Coast Main Line from 2018. The new trains will bring faster services and additional capacity to major UK cities, along the Great Western Main Line between London, Reading, Bristol, Cardiff and Swansea, and on the East Coast Main Line between London, Leeds, Newcastle and Edinburgh. The Nichols consortium's review highlighted that Network Rail had not applied its efficiency overlay or portfolio risk overlay to this project, which we did.

9.89 **East West Rail** comprises the re-opening of Bedford – Bletchley – Bicester – Oxford as a through route with a link to Aylesbury. This will open up new journey opportunities for both passengers and freight by providing direct connectivity between Oxford, Aylesbury, Milton Keynes and Bedford. This should facilitate economic growth by stimulating residential and commercial development along the route. The project has strong local stakeholder support. As with IEP, the main adjustment we made was to apply Network Rail's own portfolio and efficiency overlay, which had not been done.

Other named schemes and CP4 rollover schemes

9.90 The project to redevelop **Waterloo** is the largest project in this category. The scheme is at the pre-GRIP stage and the intention is to define and develop a scheme that will deal with long-term growth at London's busiest terminus station. Uncertainty around the outputs of this project illustrates why we have decided to revisit costs when the outputs are more fully defined. Network Rail applied its efficiency and portfolio overlays but we have removed these to bring the costs in line with the amount assumed in the SoFA. We have also re-profiled the costs to be more realistic as the project is likely to be a phased delivery throughout CP5.

9.91 **Western access to Heathrow** will create a new route from Heathrow terminal 5 onto the Great Western Main Line heading west. Network Rail and DfT have been working with aviation stakeholders and the project has strong local support. The information provided was good. But the Nichols consortium's review highlighted that the wrong cost base was used in the SBP submission and we have adjusted this accordingly. The HLOS stated that delivery of this project is anticipated to extend into CP6.

9.92 Completion of **Birmingham New Street** station is due in March 2015. The main work in CP5 is to re-construct the eastern portion of the station, including building the shopping centre above. This will enhance the passenger experience, reduce overcrowding and improve access. Progress throughout CP4 has been good, in spite of considerable difficulties, both with overcoming extra works required by structural problems with the existing building and with the continuing difficult access which has to be carefully controlled to minimise disruption to the operational parts of the station.

HLOS capacity metric schemes

9.93 This bundle contains 27 projects at a total cost of about £900m. The Arup work confirmed that these projects are required to deliver the remaining portion of the capacity metrics over and above the committed projects and named schemes. We have made some minor adjustments, including reducing the estimate for the Reading to Ascot platform lengthening to account for opportunities to reduce scope through the use of selected door opening rather than infrastructure works.

9.94 About half of the costs relate to five **traction power supply upgrade projects** in the Anglia, Sussex, Wessex, Kent and London North East routes. Whilst we have made some adjustments to these projects at this stage of the review they will be revisited in the next step that we identified earlier.

9.95 Platform extensions at eight stations on the **Uckfield Line** to allow 10 car train operation continues a series of similar projects on the Sussex route in CP4. The scheme has fewer dependencies than most platform extension schemes, given that a wider trackbed is in place for the single running line.

9.96 The scope and outputs for the **London Victoria station congestion relief** scheme should provide a much needed increase in circulating space and re-organisation of the ticket office and gatelines. The work needs to dovetail with the other master plan improvements at Victoria and also London Underground's tube station upgrade.

9.97 A key part of the **East Kent re-signalling** scheme is the construction of a new station at Rochester on land provided by the local authority. Other work consists of track and signalling improvements to get 12 car trains on the route and to reduce signalling headways between Rochester and Gillingham.

9.98 **North West train lengthening** work consists of platform extensions at up to 60 sites. Although the detailed selection and definition of project requirements is at an early

stage, this is work which is familiar to Network Rail, having completed a large number of platform extensions on the network in CP4.

9.99 Works for the **Midland Main Line capacity** project comprise platform extension and associated track and signalling works. We found some inconsistency in pricing between different locations. However, when compared to benchmark rates the direct construction costs were slightly low, whilst the indirect costs were high. We have altered the cost allocation to reflect this. The specification for the work, which is currently at GRIP 2, is based on the rolling stock in use today. Any change to this will affect the planned project outputs.

Overlay for other adjustments

Table 9.5: Breakdown of our enhancements overlay in England & Wales

£m (2012-13 prices)	ORR determination
Capitalisation of overheads	-56
Management of inflation Management of occupational health Frontier shift	-39
Property schemes and assumed investment framework schemes that are income generating	+375
Additional Schedule 4 costs	+169
Additional match funded R&D financial incentive	+45
Total	**+494**

9.100 As explained in chapter 5 Network Rail's support functions provide services to enhancements projects where the costs of these activities are capitalised rather than expensed in the year. Analysis of the SBP showed an additional capitalised cost of £62m in CP5 which did not directly link to its assumptions on support costs and Network Rail has not been able to adequately explain this inconsistency. As a result, we have deducted £62m from enhancement costs across Great Britain. We have divided this amount between England & Wales and Scotland based on current train kilometres and have therefore deducted £56m in England & Wales.

9.101 As with other areas of expenditure we have applied an overlay for cost savings that will come about by better management of inflation and better management of occupational health. This is described more fully in chapter 4. We have also applied

an overlay for frontier shift, where we have agreed with the CEPA analysis described earlier in this chapter.

9.102 Explained more fully in chapter 18 there are some projects not included in the SBP that will generate an income for Network Rail, which we have considered in Network Rail's other single till income. Therefore, we need to include an assumed cost of these projects, £416m across Great Britain. As with the capitalised cost we have divided the total between England & Wales and Scotland based on current train kilometres, resulting in an additional £375m in England & Wales.

9.103 As a result of our **recalibration of Schedules 4 and 8**, explained in chapter 20, Network Rail requested that we make an allowance of an extra £169m in its enhancements costs. We did not have time to scrutinise this before the draft determination but will do so for the final determination. We have included the extra amount in our revenue requirement calculation.

9.104 As set out in chapter 19 we are signalling our support for **research and development and innovation** as a means of improving Network Rail's productivity and reducing its costs in the medium to long-term. Subject to a well justified proposal from the company, we will introduce a matched-funding financial incentive whereby we will match each additional pound which it spends on R&D or innovation (up to a cap of £45m). This is in addition to the innovation element of the Development fund, announced in the HLOS.

European Rail Traffic Management System (ERTMS)

9.105 Costs for this project are in renewals expenditure and are not included in enhancements expenditure. However, as explained in chapter 8 we have decided to treat ERTMS train fitment costs in the same way as an enhancement ring-fenced fund.

9.106 In the SBP Network Rail sets out the industry's ERTMS implementation milestones in CP5. ERTMS is the agreed future train control and command system for the European main line network, and the national implementation plan spans some 30 years. It will be commissioned on the Great Western Main Line between London and Bristol in 2019 and on the East Coast Main Line between London and Peterborough in 2020. It is a cross-industry programme requiring coordinated

changes to lineside infrastructure, control centres, rolling stock (including passenger, freight and engineering trains) and the roll-out of new operational procedures.

9.107 The successful commissioning of ERTMS in CP5 will therefore require clarity of Network Rail's obligations so that third parties can plan their business with certainty. Network Rail will publish its key ERTMS milestones in the CP5 enhancements delivery plan, so that its obligations are clear to all parties and are subject to regulatory change control.

9.108 Within its SBP submission for renewals expenditure, Network Rail also included £206m of funding to retro-fit rolling stock to make it compatible with ERTMS train control on the above routes. Network Rail has embedded these costs into its route based signalling renewal costs and they are difficult to identify. The funding is specifically for industry to undertake first of class design and for wider fleet fitment for non-franchised fleets such as freight and open access operators. Due to different vehicle cab layouts the design will need to be bespoke for each different class of rolling stock and there are risks involved in procuring and implementing this on operational fleets that Network Rail has not included within its £206m SBP estimate.

9.109 The design and fitment work will be procured by Network Rail through negotiations with rolling stock companies and other third parties, but Network Rail will need to put governance in place to provide assurance that the costs incurred are efficient. We have decided to treat this as a ring-fenced fund, reported in the CP5 enhancements delivery plan. Although we have not made any adjustments to Network Rail's submission, our final determination will adjust these costs to allow for a reasonable level of risk. Any forecast overspend at the end of the control period will then be subject to an ex-post efficiency review.

Depots & Stabling and Ancillary Works

9.110 The level of project costs assumed in this determination provide enhanced route capability which will allow train operators to run longer and more frequent trains, and in some cases new journey opportunities. This requires either new or cascaded rolling stock for services to start running by the end of CP5. Given the current re-franchising timetable and the further project development work still required it is not yet possible to specify with any certainty what the scope of work will be for the necessary depot, stabling and rolling stock compatibility works for each route.

9.111 An estimate for these works was given to us by DfT, totalling £80m for depots and stabling for the HLOS capacity metric projects, £94m for depot and stabling works resulting from the electrification programme in CP5, and £130m for gauge, platform and electric compatibility works, totalling £312m in CP5. Given that these works are unlikely to be delivered by Network Rail but rather by the train operators or rolling stock suppliers, we have not included this in our calculation of Network Rail's revenue requirement, because this would benefit Network Rail unnecessarily.

9.112 We have, however, included an allowance of £224m[162] in our affordability assessment, to ensure that these essential works would be affordable. When there is more certainty about the scope and funding of the works and how they will be financed (for example whether through the franchise or not) the arrangements will then be finalised.

Scotland

Review of Projects

9.113 Table 9.6 shows a breakdown of our assumed costs for projects in Scotland. This was mainly informed by our own review but it also includes some other adjustments recommended by the Nichols consortium.

Table 9.6: Overview of our assumptions on project costs in Scotland

£m (2012-13 prices)	SBP	ORR determination	Difference
EGIP	489	490	+1
Borders	124	127	+3
Other Scottish projects	665	583	-82
Ring-fenced funds	145	145	0
Overlay for other adjustments	-	+62	+62
Total	1,423	1,407	-16

Edinburgh to Glasgow Improvements Programme (EGIP)

9.114 The Scotland HLOS required Network Rail to deliver EGIP, which will be subject to separate commercial arrangements. Network Rail has been developing the scope of works and delivered some infrastructure elements of the programme in CP4 through

[162] Calculated by deducting £80m which was included in the SoFA from the total amount of £312m.

the investment framework. Network Rail included a total of £489m of CP5 expenditure in the SBP for EGIP.

9.115 We approved a target price for **electrification of Springburn to Cumbernauld** through the investment framework in January 2013, with the latest forecast of CP5 expenditure at £16m. We have assumed that this is the efficient expenditure for this project rather than Network Rail's SBP proposed cost of £26m.

9.116 Network Rail has split the remaining forecast EGIP expenditure into three projects:

(a) Electrification of Glasgow to Edinburgh via Falkirk High,

(b) Construction of Edinburgh Gateway Station; and

(c) Infrastructure works including: work at Glasgow Queen Street to accommodate longer trains and improve capacity; platform extensions; signalling improvements; and works at Edinburgh Waverley station to improve capacity.

9.117 Some of the scope has been developed to GRIP 4 in CP4, such as design for electrification of the Glasgow to Edinburgh via Falkirk High line. However, Network Rail is currently awaiting clarification from Transport Scotland on the detailed requirements and timings for the overall programme. There is still uncertainty around some elements of the scope, for example works at Glasgow Queen Street and Edinburgh Waverley stations. We have assumed Network Rail's most recent estimate of £474m, as a provisional sum and we will decide the efficient cost at a later date, when Network Rail and Transport Scotland have agreed the target price arrangements.

Borders

9.118 The Scotland HLOS requires completion of this project, to reinstate the former Waverley Line between Edinburgh and Tweedbank. Although Network Rail stated that this project is at GRIP 3 in the SBP for planning purposes, the main civil works for this project recently started and the project is on schedule to complete in June 2015. We approved the funding for this project through the investment framework in October 2012, including forecast CP5 expenditure of £127m.

Other Scottish projects

9.119 Network Rail has worked with Transport Scotland to develop both **Aberdeen to Inverness Improvements (Phase 1)** and **Highland Main Line Improvements**

(Phase 2) to GRIP 3 and GRIP 2 respectively in CP4. However, the requirement and phasing for both were changed in the Scottish HLOS.

9.120 Aberdeen to Inverness Improvements (Phase 1) was developed as a programme of works with four phases, planned to be delivered across CP5 and CP6. In response to the HLOS, Network Rail has included the cost of all four phases in CP5, totalling £280m. We have applied some minor adjustments based on the conclusions of the Nichols consortium review. Transport Scotland raised concerns that Network Rail's estimate was too high as it expects this programme to be delivered over two control periods. However, the CP5 scope cannot be confirmed until timetabling work and option selection is complete. We have decided to set a cap for the CP5 expenditure to address Transport Scotland's concerns.

9.121 The SBP included £121m for Highland Main Line Journey Time Improvements Phase 2. However, this estimate is based on broad assumptions as significant timetable and scope development will need to be re-worked before the scope is confirmed. The Nichols consortium reviewed the costs and recommended there was too much uncertainty to determine the efficient cost, but identified some minor adjustments due to an incorrect price base.

9.122 The HLOS includes a **rolling programme of electrification**, covering around 100 single track kilometres per annum following completion of EGIP. Network Rail proposed five routes to be included in the programme totalling around 225 single track kilometres. Network Rail included a proposed cost of £171m for this programme. The Nichols consortium reviewed this estimate recommending that around half the scope is sufficiently defined to apply the adjusted efficiency target. We have therefore assumed an efficient cost of £168m. The SBP does not include electrification of the East Kilbride branch which has not been included in our determination. However, we recognise the industry is working up plans to deliver this through a potential alliance and funding can be addressed in between periodic reviews through the investment framework.

9.123 **Motherwell signal box re-signalling** and **Motherwell Depot stabling** improvements will support more effective operation of train services in the area, improved servicing of trains and improved track maintenance. Network Rail included CP5 cost estimates of £11m for the Motherwell re-signalling and £10m for the stabling improvements. At the time of SBP publication, it became clear that the southern end of the re-signalling

was incorrect, reducing Network Rail's estimate to £3m. We have reviewed Network Rail's estimates for these projects and determined that they are reasonable - £3m for Motherwell re-signalling and £10m for Motherwell stabling improvements.

9.124 The remodelling of **Carstairs Junction** provides an opportunity to take advantage of a CP5 renewal project in the area and significantly reduce long distance journey times. The **Edinburgh Suburban electrification** project would remove an 'island' of non-electrified railway in the Edinburgh area and provide more flexibility for freight services. The HLOS did not specify the requirement for either project and we have removed them from the determination. This does not prevent either scheme being taken forward in CP5, for example through the investment framework, should funding be identified. Indeed, in respect of Carstairs, and the benefits this will bring to Anglo-Scottish services, further discussion about the development of this scheme is underway between DfT, Transport Scotland, Network Rail and ORR.

Overlay for other adjustments

Table 9.7: Breakdown of our enhancements overlay in Scotland

£m (2012-13 prices)	ORR determination
Capitalisation of overheads	-6
Management of inflation Management of occupational health Frontier shift	-8
Property schemes that are income generating	+23
Assumed investment framework schemes that are income generating	+19
Additional Schedule 4 costs	+29
Additional match funded R&D financial incentive	+5
Total	**+62**

9.125 As explained in chapter 5 Network Rail's support functions provide services to enhancements projects where the costs of these activities are capitalised rather than expensed in the year. Analysis of the SBP showed an additional capitalised cost of £62m in CP5 which did not directly link to its assumptions on support costs and Network Rail has not been able to adequately explain this inconsistency. As a result, we have deducted £62m from enhancement costs across Great Britain. We have

divided this amount between England & Wales and Scotland based on current train kilometres and have therefore deducted £6m in Scotland.

9.126 As with other areas of expenditure we have applied an overlay for cost savings that will come about by better management of inflation and better management of occupational health. This is described more fully in chapter 4. We have also applied an overlay for frontier shift, where we have agreed with the CEPA analysis described earlier in this chapter.

9.127 Explained more fully in chapter 18 there are some projects not included in the SBP that will generate an income for Network Rail, which we have considered in Network Rail's other single till income. Therefore, we need to include an assumed cost of these projects, £416m across Great Britain. As with the capitalised cost we have divided the total between England & Wales and Scotland based on current train kilometres, resulting in an additional £42m in Scotland.

9.128 As a result of our recalibration of Schedules 4 and 8 Network Rail requested that we make an allowance of an extra £29m in its enhancements costs. We did not have time to scrutinise this before the draft determination but will do so for the final determination. We have included the extra amount in our revenue requirement calculation.

9.129 As set out in chapter 19 we are signalling our support for **research and development and innovation** as a means of improving Network Rail's productivity and reducing its costs in the medium to long-term. Subject to a well justified proposal from the company, we will introduce a matched-funding financial incentive whereby we will match each additional pound which it spends on R&D or innovation (up to a cap of £5m).

Interoperability

9.130 Interoperability is a European Commission initiative to promote a single market in the rail sector, making it easier for trains to travel across different rail networks. This is partly achieved through common specifications - the Technical Specifications for Interoperability (TSIs). Statutory requirements for interoperability are set out in The Railways (Interoperability) Regulations 2011.

9.131 The SBP included the assumption that implementing an interoperable railway would not require specific additional costs in CP5 beyond existing levels of capital

expenditure. We have decided that the assumed level of expenditure for maintenance, renewal and enhancements is sufficient to meet the requirements of the interoperability regulations and the TSIs, and therefore our determination is on this basis.

Review of ring-fenced funds

9.132 Both HLOSs made provision for ring-fenced funds. In some cases these were a continuation of a mechanism in use in CP4. Funds provide Network Rail flexibility (sometimes with rail industry partners) to specify projects to deliver outputs or strategic aims. In principle, we think these types of funds are a good idea as it gives flexibility around how certain strategic objectives should be delivered. In CP4 total expenditure on the equivalent funds is expected to be £1.4bn in England & Wales and £43m in Scotland (2012-13 prices)[163].

9.133 In England & Wales, Network Rail has proposed a further breakdown of some of the funds, in line with the HLOS. We agree with the proposed split.

9.134 Our role is:

(a) to check Network Rail's approach for each fund is likely to deliver efficient outcomes, by making sure effective governance processes are followed and that they deliver projects at efficient costs by assessing a sample of schemes;

(b) to check if progress is on target to meet Network Rail delivery plan milestones;

(c) to decide what is published and approve changes to Network Rail's delivery plan; and

(d) to resolve disputes / arising issues – e.g. accelerated funding.

9.135 We do not participate in scheme selection.

9.136 We looked at the use of CP4 funds[164]. Generally, stakeholders have been well engaged in the management of funds through working groups. However: governance arrangements have not always been sufficiently formalised; passenger groups have not always been well represented on governance or working groups (for example the

[163] Reported in Appendix 24 of the SBP databook which updates actual and forecast expenditure for CP4 and replaces the 2013 delivery plan update.

[164] http://www.rail-reg.gov.uk/pr13/PDF/sdg-efficient-enhancement-expenditure-0312.pdf and http://www.rail-reg.gov.uk/server/show/nav.2231.

performance fund uses an industry group the National Task Force for governance); in some cases management and reporting at fund-level has been weak (particularly in early stages), resulting in slippages and risk of non-delivery in CP4.

9.137 In our August 2012 outputs consultation[165], we asked for views on indicators to measure the efficiency and effectiveness of the use of the funds. The responses were generally supportive of funds. Several were keen on greater transparency of cost/programme reporting and business cases. Some supported the introduction of indicators to measure efficiency. Network Rail opposed introducing indicators as they may be too cumbersome and will not work for all funds. They also did not consider that average benefit cost ratio (BCR) is effective but rather the number of schemes completed would be a more appropriate measure. Passenger Focus stated that we need to consider passenger-centric outputs rather than just process and milestones.

9.138 In the Secretary of State's statutory guidance to ORR[166], the government stated that it expected value for money to play a key role in prioritising the use of industry-led funding pots in England & Wales.

9.139 In the Scotland, HLOS Scottish Ministers required that management of the funds reflect a number of principles, including: simplicity; evidence based; benefits to passengers and freight users; clarity on purpose and transparency on outcomes. The final arrangements in Scotland must adhere to these.

9.140 Many of the HLOS projects are focused on increasing capacity on the network at key pinchpoints, but there are also wider issues to be tackled in terms of network resilience both from a climate change and a performance point of view. To this end a Passenger Journey Improvement fund of £300m has been included in the Secretary of State's HLOS and this determination. This fund will be targeted at improving the service to passengers. It is expected that activities will be focused on three areas; journey time improvement, performance/reliability improvement and other enhancement opportunities that emerge. We are looking to Network Rail and the industry to identify where interventions are required. We expect options for adding line speed improvements to existing renewal and enhancements schemes will be

[165] http://www.rail-reg.gov.uk/pr13/consultations/outputs.php.

[166] www.gov.uk/government/uploads/system/uploads/attachment_data/file/3642/sos-guidance-to-orr.pdf.

considered, as will locations for targeted improvements (for example six of the top ten locations for reactionary ('knock on') delays are on the Brighton Main Line). The flooding at Cowley Bridge junction in 2012 is an example of problems with network resilience.

9.141 Both during and beyond CP5, there will be significant opportunities to raise line speeds and increase capacity – including the electrification of significant parts of the network, and in particular the roll out of ETCS and other new technologies for the management and operation of the network. Alongside the expected longer term impact of HS2, these changes have the potential to offer additional journey-time improvements, with potential economic and connectivity benefits. We are looking to Network Rail, working with the industry, to consider on the back of their Market Studies consultation, the scope for journey time improvements from the enhancement of long-distance routes, their social costs and benefits, and their impact on connectivity across Great Britain, comparing options make wider changes in the capability and line speeds across the network as technological changes come on stream, alongside targeted interventions to improve journey times and capacity by, for example, addressing bottlenecks. This work should report in time to inform the strategic business plan for the 2018 periodic review.

Governance arrangements

9.142 ORR expects that robust and transparent governance arrangements will be in place for CP5. These will be finalised in the enhancements delivery plan. Network Rail will consult on its draft delivery plan in December 2013. We will take any consultation responses into account before agreeing the final plan. However, the SBP supporting document 'Definition of CP5 enhancements' included a section on each of the funds which we have reviewed against the following criteria:

(a) degree of formalisation;

(b) passenger group input;

(c) reporting arrangements; and

(d) criteria for scheme selection.

9.143 Through the review we have agreed with Network Rail the following measures.

Degree of formalisation

9.144 Governance arrangements for new funds will be formalised by the existing cross industry planning oversight group on behalf of the Rail Delivery Group[167]. The Network Rail fund holder will ensure Terms of Reference (ToR) for each fund are established and that these will be consistent with the overarching governance arrangements. As it will not be practical to involve every stakeholder in all of the funds, Network Rail should set out why specific stakeholders are involved. Regional transport agencies such as TfL and the PTEs are important stakeholders and are currently included in the Rail Industry Planning Group (RIPG) [168] which was originally established by Network Rail to provide governance[169] over the RUS programme.

Passenger group representation

9.145 As in CP4 passenger groups will be involved through RIPG, which will oversee all funds. Passenger interests should be clearly reflected in the governance of the funds with issues that matter to them considered when schemes are selected. This will be done at both the overview level with passenger group involvement and at a local level with train operator involvement. Other organisations such as local authorities and local enterprise partnerships also represent passenger interests. We expect to see evidence that scheme selection meets the needs of passengers.

Reporting and transparency

9.146 A one-page template, describing each scheme being progressed through the funds, will be published on Network Rail's website. In addition, progress will be reported to the Rail Industry Planning Group and through the enhancements delivery plan.

Scheme selection

9.147 A minimum hurdle rate will be set for funds where it is appropriate, such as the NRDF element of the Passenger Journey Improvement fund. The selection criteria should be made transparent and will be set out in the enhancements delivery plan.

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[167] http://www.raildeliverygroup.org/Home.aspx.

[168] This group is currently chaired by Network Rail and involves DfT, Transport Scotland, Welsh Government, ATOC, Rail Freight Group, Rail Freight Operators Association, TfL, Centro, Passenger Focus and ORR.

[169] http://www.networkrail.co.uk/browse%20documents/rus%20documents/route%20utilisation%20strategies/network/other%20publications/rus%20governance.pdf.

9.148 In cases where a BCR is not applicable there will be alternative selection criteria which should ensure that benefits to passengers and freight users are considered. This should be made easily understandable and transparent to stakeholders.

9.149 The steering group for any fund is responsible for deciding what projects should be progressed. It is then the responsibility of the fund holder to secure the right levels of funding for a specific project, and to deliver it efficiently through the Network Rail investment authority process.

9.150 The scheme selection for Scottish funds requires that key decisions are taken that will benefit Scotland's rail users and support the policies and priorities of Scottish Minsters. Transport Scotland therefore has a specific role in the governance arrangements.

Monitoring in CP5

9.151 We want to increase transparency and incentivise efficient delivery and value for money of schemes progressed through the funds.

9.152 We will use both in-house staff and the independent reporters to complete reviews on a sample of schemes and track recommendations from previous studies on how to improve fund management and governance. In England & Wales we will check that projects are delivering minimum BCRs and where a BCR is not applicable assess whether benefits to passengers and freight users are being realised. In Scotland we will review projects against the principles specified in the HLOS. As with all of our reviews we will publish results on our website and conclusions in our Network Rail Monitor.

Passenger benefits

9.153 In addition to the passenger benefits delivered by the individual projects, identified in the earlier section, we will make sure passenger interests are reflected in the governance of the funds with issues that matter to them considered when schemes are selected.

9.154 While the outcome of enhancements do not get specifically picked up in the National Passenger Survey it is probably one of the biggest drivers of satisfaction in areas where the benefits are delivered. Therefore, we will make sure that enforceable milestones are based on the timing of the delivery of passenger and freight customer benefits, as this is what matters to them.

9.155 We will also carry out selected surveys on scheme completion to measure consumer benefits.

Freight benefits

9.156 The Strategic Freight Network has been widely supported in CP4 and is delivering infrastructure for more capacity and longer trains where it is needed. The fund will continue in CP5 in England & Wales and a new one will be created in Scotland.

9.157 In addition, there are many freight benefits accruing from other schemes. For example gauge clearance on the Midland Main Line through the electric spine combined with East-West Rail will provide potentially shorter routes because freight will be able to move from Southampton to Daventry more directly than it currently does. Another example is the remodelling of Ely North junction to provide for forecast freight flows across East Anglia as well as enhanced passenger services between Cambridge and King's Lynn or Norwich.

10. Deliverability of engineering work

Key messages in this chapter

- In determining the component parts of the CP5 package we have looked at whether outputs are achievable. We also explain whether the overall package can be delivered safely. In this chapter we set out our conclusions on whether Network Rail is capable of delivering the maintenance, renewals and enhancement work set out in this settlement.
- Network Rail is a GB wide company and whilst much of the work will be delivered by the devolved routes our assessment of programme deliverability has been done at the overall level. Our conclusions are therefore at a Great Britain wide level, but include consideration of issues specific to Scotland.
- Using expenditure as an indication of the amount of work to be done in CP5 compared with CP4, there is broadly the same aggregate level of renewals[170] and an 8% increase for enhancements[171]. Network Rail's own assessment concludes that it has a high level of confidence in successfully delivering the required work whilst still meeting its obligations on cost and performance.
- We have reviewed Network Rail's assessment, taking into account its track record and how it is planning to manage the delivery risks that it has identified so far.
- We have also commissioned our own work in specific areas of risk, such as on complex programmes like ERTMS, or work requiring significant step changes in activity, for example the electrification programme.
- In conclusion we agree with Network Rail's overall assessment. It has identified the key factors constraining delivery and has action plans in place to deal with them. There is a process in place with executive-level review to identify further risks and manage them. Given the risks remaining we have decided to regularly review Network Rail's progress against its own action plans.

[170] Comparing our assumed level of GB renewals in Table 3 of the Summary (£12,681m) with the forecast levels in Network Rail's SBP for CP4 (£12,686m) both in 2012/13 prices.

[171] Comparing our assumed level of GB enhancements in Table 3 of the Summary (£12,239m) with the forecast levels in Network Rail's SBP for CP4 (£11,294m) both in 2012/13 prices.

Key messages in this chapter (continued)

- The main uncertainty is the enhancements at an early stage of development where it is not yet possible to fully define the scope of work. We require Network Rail to update its deliverability assessment regularly as these projects become more certain and the delivery dates become clearer in the enhancements delivery plan. This is important to make sure Network Rail has assessed deliverability of the overall programme as these projects become more defined. We also require Network Rail to update its deliverability assessment when it submits its plan for spend on civil engineering renewals for years three, four and five.

Introduction

10.1 In the relevant chapters we explain our approach on a range of outputs and efficient costs that will form the CP5 package that Network Rail is funded to deliver:

(a) in chapter 11, we look at whether we think the overall package will be delivered safely;

(b) in chapter 3, we looked at outputs and explain our conclusions on each of these including judgements as to whether specific targets, such as PPM, are challenging but achievable; and

(c) in chapters 5 to 9, we looked at efficient expenditure and concluded whether efficiency targets were achievable. For example, in determining efficient operations costs we did a specific deliverability assessment of the operating strategy. And, for our assumptions on maintenance and renewals costs, we examined the volume levels.

10.2 This leaves the question as to whether the total programme of engineering work (maintenance, renewals and enhancements) can be delivered and this chapter explains our conclusions on this.

10.3 Network Rail is a GB wide company and whilst much of the work will be delivered by the devolved routes our assessment of programme deliverability has been done at the overall level. Our conclusions are therefore at a Great Britain wide level.

10.4 We have compared CP4 to CP5 by using expenditure as a proxy for the amount of work required. One of the most significant increases in renewals is within the

signalling asset, which will nearly double in volume, partly as a result of the operating strategy explained in chapter 7. As well as the work mix changing there will also be different challenges in terms of complexity, for example the operational roll-out of ERTMS on parts of the main line network.

10.5 Several industry responses to the SBP referred to the ability for Network Rail to deliver the programme with the Civil Engineering Contractors Association (CECA) mentioning pinch points in the plan around particular resources, specifically piling associated with the electrification schemes. CECA went on to comment that it believes that the large workload should offer opportunity for innovation and investment in more efficient machinery.

Framework for assessing deliverability

10.6 Assessing deliverability in the context of a periodic review does not fit neatly with any established frameworks, such as HM Treasury's tool kit for assessing a project's management case. As set out in chapter 9 the HLOSs specified a large number of projects, many of which have not yet been developed sufficiently to define and plan the scope of work. This has made it difficult to conclude in absolute terms on whether the package of work is deliverable. We have therefore reviewed Network Rail's process of assessing and managing the risks, and commissioned some specific reviews of our own to test Network Rail's conclusions.

10.7 We have had to strike a balanced view on whether Network Rail's current action plans are sufficient, given the current uncertainties and the time available to manage and reduce the risks.

Network Rail's analysis

10.8 Network Rail has developed ways of assessing deliverability under different planning horizons, i.e. short-term planning of possessions, medium term integration of projects and long-term planning to identify strategic demand/supply issues. In the SBP its deliverability analysis focused on identifying long-term risks. Its assessment collated and challenged the ten individual route plans until it had a sufficiently robust national assessment. The assessment focused on understanding what the critical factors were and identifying mitigating actions. We agree with Network Rail that it is not realistic to

expect a single integrated and resourced plan for all maintenance, renewals and enhancements work at this stage of the planning cycle.

10.9 The analysis provided with the SBP looked at the key factors influencing deliverability, their status and the actions required to increase the confidence in Network Rail's ability to deliver the plan.

10.10 The SBP included a summary of the conclusions of its assessment, with the main factors constraining deliverability being:

(a) increased access requirements compared to CP4;

(b) a shortfall in plant and logistics, particularly tilting wagons and ballast cleaners;

(c) the amount of track renewals and the ability to deliver these with less disruptive engineering closures, e.g. an adjacent line open; and

(d) the amount of electrification work, in particular requiring more supervisory, engineering and management resources.

10.11 Network Rail has action plans against each of these and has a high level of confidence that it can address them in the time available to successfully deliver the required outputs for CP5.

ORR analysis and conclusions

10.12 We have agreed with Network Rail's assessment of what it needs to do to build the capability of its own organisation and that of the supply chain so that the work volumes in CP5 are achievable. We noted the volume of work is greater than in CP4 and the portfolio is less mature than was the case at the same point in the previous control period. There is also a significant demand for electrification resources that was not required in CP4 and some notable route-based concentrations of work, such as on the Great Western Main Line.

10.13 We found that it had identified the right risks and was actively managing them, with action owners named and an executive-level review process in place.

10.14 In addition to our review of the SBP, we commissioned some specific pieces of work to look at areas of complexity and uncertainty:

(a) Halcrow reviewed Network Rail's readiness to implement the ERTMS schemes in CP5. They concluded that the likelihood of success depended on Network Rail

completing a series of important actions in 2013[172]. We will be closely monitoring Network Rail's progress against these;

(b) Nichols reviewed the programme management arrangements of the emerging portfolio of projects in the north of England, which is a CP5 deliverable. Network Rail has agreed to the recommendations and is getting on with implementing them. This increased our confidence that this programme can be delivered within CP5[173];

(c) we reviewed Network Rail's electrification resourcing strategy and attended an internal Network Rail review to build our confidence that Network Rail's actions were being put into practice. For example a key mitigating action is for Network Rail to contractually commit to framework agreements with suppliers so that they have certainty to start building capability ahead of the main implementation timescales; and

(d) as part of our CP4 work we are reviewing the deliverability of the Great Western Main Line electrification programme, which has slipped against its original project plan, but has recently completed a significant development milestone (GRIP 3) and we are more confident in the revised programme.

10.15 Under an early start mechanism we have allowed Network Rail to commence work on some enhancements projects now so there is no hiatus and Network Rail can plan ahead with the industry. This will help to mitigate risk of non-delivery in CP5.

10.16 However, there are still significant challenges for Network Rail to overcome, including:

(a) there is not currently a joined-up and integrated specification and plan covering all infrastructure, rolling stock and depot changes required for CP5. This is needed as soon as possible to give assurance that scope and outputs are aligned and optimised;

(b) there are notable concentrations in the scale of work being undertaken by Network Rail in CP5 that inevitably create deliverability risks, for example the Western route which is responsible for about 20% all projects with a total cost of over £3bn including Reading, Crossrail, IEP, several electrification schemes and

[172] http://www.rail-reg.gov.uk/server/show/nav.2231.

[173] http://www.rail-reg.gov.uk/server/show/nav.2231.

ERTMS. Network Rail's route plans and our detailed review of the electrification projects provides evidence of the focus and commitment to this major upgrade programme, but this undoubtedly represents a major challenge to efficient and timely delivery. Other examples are the East Coast Main Line and Midland Main Line that have a total of around £2bn of assumed investment;

(c) the profile of SBP expenditure shows cost falling significantly towards the end of the control period. This appears to be unrealistic for a portfolio that includes so many schemes at an early stage of development and we have made an adjustment to re-profile Waterloo and Electric Spine expenditure towards the end of the control period; and

(d) in some areas there will be demand peaks for highly specialised skills.

10.17 Considering all the above, we have concluded that the CP5 work volumes are deliverable, but this relies on a robust approach to risk management. We propose to hold regular reviews with Network Rail to provide assurance that this is happening.

11. Health and safety

Key messages in this chapter

- Network Rail has a legal obligation under the Health and Safety at Work etc. Act 1974 to maintain and, where reasonably practicable, improve health and safety and nothing in our determination should prevent Network Rail from complying with health and safety law.
- We will continue to inspect and monitor Network Rail's health and safety management and performance in CP5 and the monitor the full range of health and safety indicators, using our regulatory tools where necessary to secure legal compliance and improvements.
- We will continue to use our rail management maturity model as a benchmark for the capability of Network Rail to manage health and safety.
- We are setting one output for level crossings; Network Rail is required to deliver a package of projects in CP5, to maximise the reduction in risk of accidents at level crossings using the £67m ring-fenced fund made available by the Secretary of State.
- Scottish Ministers provided a ring-fenced fund of £10m to facilitate the closure of level crossings. This is being managed in the same way as other specific funds made available by the Scottish Government.
- We have assumed a different profile for efficiency assumptions for track maintenance (this includes off track in CP5), partly because of our concern about how quickly Network Rail can introduce its planned initiatives and new ways of working without compromising safety.
- Risks to the workforce from high voltage electricity, from being hit by trains and from working with road rail vehicles will be improved through the development and provision of new equipment.
- We expect Network Rail to implement its health and wellness strategy and to show how it is improving its management of health risks.
- We will monitor Network Rail's implementation of its long-term strategy for safety and wellbeing.

Introduction

11.1 Network Rail is required through the determination to provide a railway that is safe for passengers, the workforce and the public, provides a good service to its customers and delivers value for money for taxpayers and funders.

11.2 Health and safety has been integral in our assessment and in our determination and in this chapter we explain the health and safety context in which we have made our determination. Our determination has been informed by the current health and safety risk profile presented by Network Rail's operations and our assessment of Network Rail's ability to manage those risks.

11.3 Health and safety is a matter reserved for the UK Government and the UK Government sets out its requirements for health and safety in the HLOS prepared by the Secretary of State. Health and safety arrangements and requirements apply equally to England, Wales and Scotland.

11.4 The primary legalisation that protects passengers, the public and the workforce is the Health and Safety at Work etc. Act 1974, which requires employers to ensure so far as is reasonably practicable the health and safety of their employees and of people who use the railway[174].

11.5 We assess Network Rail's health and safety performance through our inspection and investigation work; we monitor its health and safety performance using indicators provided by the rail industry and we compare its performance with other railways.

11.6 We have a range of regulatory tools to secure improvements in health and safety standards and to secure legal compliance with health and safety law. We have a strategy for regulation of health and safety risks[175].

Our approach to health and safety in the determination

11.7 In our determination we have taken into consideration:

(a) the health and safety risks to passengers, the public and the workforce as a result of Network Rail's operations.

[174] The term reasonably practicable has a long established history in legislation, it is a narrower term than physically possible and means that the degree of risk in a particular situation can be balanced against the time, trouble, cost and physical difficulty of taking measures to avoid the risk.

[175] See our website at: http://www.rail-reg.gov.uk/server/show/nav.1243.

(b) our assessment of Network Rail's ability to control those risks, based on evidence from our inspection findings and our assessment of Network Rail's health and safety management system using our railway maturity model; and

(c) whether the challenge to Network Rail in terms of our overall package, including the level and phasing of our efficiency challenge is consistent with Network Rail meeting its safety obligations.

11.8 To make our assessment and determination, we have reviewed the SBPs, held a specific health and safety meeting with Network Rail as part of our series of challenge meetings and sought clarification on health and safety issues at route meetings.

HLOS requirements

11.9 The Secretary of State considers the continued safe operation of the railway to be of the utmost importance and requires the industry to continue to improve its record on passenger and worker safety through the application of the "so far as reasonably practicable" approach and to ensure that current safety levels are maintained and enhanced by focusing domestic efforts on the achievement of European Common Safety Targets.

11.10 The Scottish Ministers have committed to working closely with the Secretary of State to ensure that the interests of Scotland are fully reflected.

11.11 The Secretary of State made a specific ring-fenced fund of £65m to reduce the risk of accidents at level crossings.

Network Rail's SBP submission

11.12 In its SBP submission, Network Rail made a number of commitments and proposals for health and safety in CP5, including:

(a) by 2019, *eliminating all fatalities and major injuries with a 50% reduction in train accident risk;*

(b) in the longer term, *everyone goes home safe every day;*

(c) to reduce the risk of accidents at level crossings by 8%, using the ring-fenced level crossing fund; and

(d) three investment funds for improvements, to road rail vehicles, for taking safer and faster electrical isolations and for alerting track workers to approaching

trains. These funds are mainly to improve the health and safety of the workforce, but will have efficiency benefits.

Health and safety in CP4

11.13 In the following paragraphs we briefly provide some health and safety context for the decisions we have made in our determination.

11.14 A review by the European Rail Agency for the period 2007 to 2010 found that the safety record for Great Britain's railways compares favourably with other European countries. Luxembourg performed the best for passenger and workforce fatality rates; the UK was joint-second with the Netherlands.

11.15 European legislation requires the establishment of industry wide Common Safety Targets and individual member state metrics (called National Reference Values). As of April 2012 the railway in Great Britain was broadly meeting employee and workforce targets.

11.16 The HLOS for CP4 set the Great Britain rail industry a target to reduce passenger and workforce risk by 3% by March 2014. Passenger and workforce risk is measured using RSSB's Safety Risk Model[176]. At December 2012, passenger risk had reduced by 5.6% and workforce risk had reduced by 8%.This is an 'all industry' measure and does not make clear Network Rail's performance on workforce safety.

11.17 Network Rail uses a fatalities and weighted injuries measure[177] to measure workforce safety. For the year ending March 2013, this measure was at 0.149, this is higher than the target of 0.092 and higher than March 2012 when the target was also missed.

11.18 There is little reliable workforce safety data for other European countries, but intelligence suggests that workforce fatalities and injuries are commonly caused by working on or near running lines, working at height, near high voltage electricity and

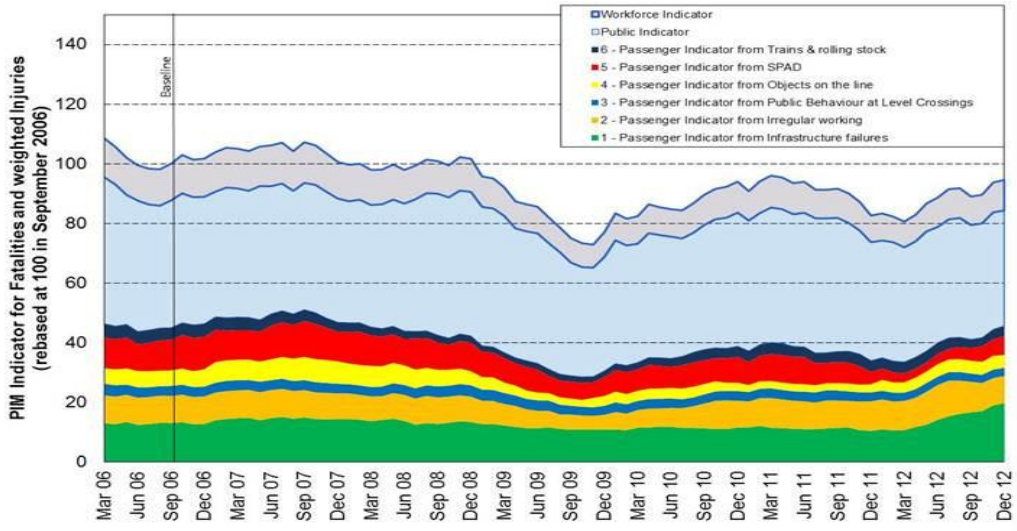
[176] The Safety Risk Model (SRM) is a quantitative representation of the potential accidents resulting from the operation and maintenance of the GB rail network. It comprises a total of 120 individual models, each representing a type of hazardous event. A hazardous event is defined as an event or an incident that has the potential to result in injuries or fatalities.

[177] Network Rail primarily measures workforce safety by the Workforce safety (fatalities and weighted injuries) measure. This measure compares the weighted number of personal injuries that are reported in their Safety Management Information System (SMIS) for all Network Rail staff and contractors working on Network Rail's managed infrastructure, normalised per million hours worked. This measure provides information to help monitor and control accidents and injuries to the workforce.

operating road rail vehicles; these are the same issues that we find on our mainline railway.

11.19 Train accidents are rare, but they are the most likely cause of serious harm to members of the public including passengers. The RSSB has developed a model to help understand the underlying risks that might result in a train accident. This is the precursor indicator model (PIM); the model controls for seasonal effects, to remove cyclic fluctuations, it quantifies changes in underlying risk and plots historical data to predict trends in the future. RSSB set a benchmark for the PIM in September 2006, to measure changes from that point.

11.20 The diagram below shows the PIM at December 2012, with an overlay to show the overall public (including passengers) and workforce indicators. The diagram shows that since the benchmark point the PIM has fluctuated but with an overall downward trend until early 2012.



11.21 Since early 2012, the risk to train passengers has now returned to about the same level as it was at the benchmark point in September 2006. Of all the measured precursors in this model, failed earthworks are now the largest single source of train accident risk to passengers because of the increase in the number of earthwork failures, due to heavy rainfall and flooding over the summer in 2012. In 2012, the incidence of structural failures was about three times the average for the preceding three years. The PIM is an industry measure, but the management of the infrastructure is the responsibility of Network Rail.

11.22 The PIM indicator for public behaviour at level crossings is at an all-time low, reflecting the work by Network Rail and the industry to manage this situation, but level crossings still present nearly half of the potential catastrophic train accident risk.

11.23 In summary, Network Rail's health and safety performance as measured by the numbers of adverse events that have happened is good compared to other European countries, but in our determination we should consider the recent increase in the risks to passengers (including the public) from the increase in infrastructure failures, the continuing risks associated with level crossings and the risks of fatalities and serious injuries to the workforce.

Our inspection work and our assessment of Network Rail's SBP

11.24 It is important to assess how well a business can control the risks it creates so that unsafe events do not happen. We assess how well Network Rail is able to identify and control risk through a programme of proactive, risk-based audit and inspection work.

11.25 Findings from our inspection work are judged against our railway management maturity model to assess Network Rail's performance against a number of components necessary for an effective safety management system. In CP4, we assess that Network Rail has improved some aspects of its management capability towards excellence but other components are some way below excellent and require improvement.

11.26 Our determination for CP5 has been informed in particular by our findings from our inspection and investigation work in the areas of infrastructure safety, workforce safety and occupational health.

Track and off track maintenance and renewals

11.27 We have inspected Network Rail's management of track, off track and civil engineering assets, because these assets have the potential to increase the risk of a train accident if they fail. Assets can fail if they are poorly maintained.

11.28 We have found insufficient resource in maintenance depots to carry out all the planned maintenance work in track and off track assets. Approximately 2,700 jobs were lost when Network Rail introduced a standard structure and resource model in its maintenance depots, to improve efficiency and reduce costs. The sizing model in

off track, drainage and some aspects of track maintenance was not properly scoped and it underestimated the actual work volumes. The lack of resource to deliver the planned maintenance volumes has been compounded by failures to fully implement new technologies such as automated track inspection systems and improve productivity through changes to working practices.

11.29 A Network Rail capability study, prompted by us found that maintenance volumes were insufficient to sustain asset condition in the longer term and recommended significant additional resource to increase volumes in track maintenance, fencing, drainage and vegetation management to begin recovering asset condition and move towards achieving maintenance volumes on exit from CP4.

11.30 This is a concern because planned maintenance addresses underlying causes of failures and a lack of planned maintenance increases the reliance on inspection and reactive maintenance to maintain a safe railway. We will continue to monitor this issue, but it is unlikely that Network Rail will meet its planned track and off track maintenance volumes in CP4.

11.31 We have served formal enforcement notices, requiring improvements to the physical condition of the assets, for example repairs to fencing; and requiring improvements to processes for maintaining a safe asset, for example management processes for proper track inspection.

11.32 In its SBP, Network Rail said that maintenance efficiencies in CP5 will come from headcount reductions, improving productivity and avoiding unnecessary work. Network Rail forecast a headcount reduction of 1,262 (8%) on the CP4 exit numbers, with a sharp reduction at the start and end of CP5. The proposed headcount reductions are not of the same order as in CP4, but in our assessment they are significant on top of the reductions already made.

11.33 Network Rail proposes to improve productivity through a number of central initiatives, described in this determination at chapter 8. These include risk-based maintenance; remote condition monitoring, changes to working practices including multi-skilling, improved information management and mechanisation.

11.34 Our assessment of the central initiatives found they are better described than similar initiatives in CP4, but their delivery is dependent on a number of other factors, for example the successful resolution of industrial relations issues and the delivery of the

refurbishment, renewal and enhancement programmes. Network Rail acknowledges many of the initiatives require a long lead time, and they will not provide sustainable efficiencies until the end of CP5.

11.35 Network Rail's Transforming Safety and Wellbeing strategy sets out a number of key enablers to support the central initiatives and to help achieve changes to working practices. Enablers include an improved safety culture, a simplified rules structure and innovation by the routes. These enablers depend on developing employee competence, capability, judgement and awareness to allow Network Rail to move to being a safer and more efficient organisation.

11.36 There is no plan linking headcount reductions in CP5 with the implementation of the central initiatives and enablers and therefore no contingency plans or go/no-go decision points in the event of central initiatives and enablers not delivering

11.37 We found a difference of opinion between some routes and Network Rail about what if any efficiency will be realised through a simplified rules structure, which is a key enabler. We engaged independent reporters to make an assessment. In their draft report, which will be published soon, they conclude it is unlikely that Network Rail will realise any significant net cost saving benefits from the simplified rules structure in CP5, but it should achieve benefits from improved compliance (safety benefits).

11.38 We found that some routes lacked an understanding of the resource required to deliver the planned off track and drainage work, even though they have agreed to achieve the maintenance and renewal efficiencies.

Conclusions – track and off track maintenance and renewals

11.39 We want to ensure that in CP5, maintenance volumes and renewals are delivered as required by Network Rail's asset policies and its SBP to provide safe track and off track assets. We are taking a number of steps to ensure that this happens. For example:

(a) in our determination, we have assumed a different profile for efficiency assumptions for track maintenance (this includes off track in CP5), giving 16.5% efficiency by the final year of CP5, compared with 13.7% assumed by Network Rail. We do not believe savings can be made beyond 16.5%, partly because of our concern about how rapidly Network Rail can introduce changes without compromising safety;

(b) we are strengthening the outputs framework and indicators for asset management and we will be monitoring Network Rail's delivery of planned asset maintenance and renewal volumes;

(c) we expect Network Rail to produce an overall maintenance strategy, either as part of its delivery plan or separately, which clarifies how the various maintenance initiatives will be optimised and integrated across the asset base. This strategy should include a change plan to show how the strategy will be delivered taking account of human factors and staff competency issues, and

(d) we will continue to audit and inspect the delivery of Network Rail's asset management systems and policies and we will use our regulatory tools to ensure safety.

Structures and earthworks

11.40 Civils structures, includes, bridges, tunnels, earthworks, embankments, cuttings and estuarine defences and their associated drainage assets.

11.41 Failures of earthworks have increased in CP4, both in overall numbers and severity, including earthwork failures at Cruachan, Loch Treig, St Bees, and Brithdir. There have been a number of occasions when trains have run into failed earthworks, including three within a 2 month period in Scotland. Nobody was seriously hurt but the potential for harm is clear. We served an improvement notice in August 2012, requiring Network Rail in Scotland to assess the risks associated with failed earthworks in adverse weather and put in place appropriate operational control measures (for example speed restrictions). We see operational control measures as an interim solution and expect the frequency and severity of earthwork failures to be reduced in CP5 through proper management of the asset. For example, through the proper provision and maintenance of drainage to cope with severe weather events. We also expect Network Rail to carry out a similar process of risk assessment and controls in other routes.

11.42 CP4 has also seen a number of structural failures including at Stewarton, Enterkin Burn Viaduct, River Crane, Bromsgrove, Old Beck and Scout Tunnel. Network Rail's knowledge of asset condition is improving, but there are still some significant gaps, for example 12,000 of the 31,000 structures do not have a current capability assessment (an assessment within the last 18 years). Our inspection work found a significant

backlog in structures examinations and we served an improvement notice requiring Network Rail to remedy this.

Conclusions – structures and earthworks

11.43 We propose to implement a new civils adjustment mechanism in CP5, chapter 8 has further details. This will allow the volume and nature of the work on civils to reflect Network Rail's improving understanding of its asset.

11.44 We will ensure that Network Rail takes account of its own risk ranking process so that civil structures assets with a high probability of failure and a very significant consequence from that failure (multiple fatalities) are prioritised in the maintenance and renewal programmes in CP5.

11.45 Both the structures and earthworks policies have been significantly revised for CP5 and we will continue to monitor how well they manage the sustainability of the asset and its resilience to adverse weather events.

11.46 The effectiveness of the new structures and earthworks policies is critically dependent on how well new practice is embedded in the devolved routes and this will be the subject of further review in 2013.

Level crossings

11.47 There are around 7,000 level crossings managed by Network Rail. The safe design, management and operation of level crossings can reduce the risks, have a positive effect on user behaviour and so reduce the number of fatal and serious incidents.

11.48 Network Rail made a commitment during CP4 to reduce the risk of accidents at level crossings by 25% through level crossing closures, renewals and upgrades. Network Rail has reported that level crossing risk reduction is currently 22.8% ahead of schedule to meet the CP4 target.

11.49 In its SBP, Network Rail proposed to reduce the risk of accidents at level crossings by 8% using the ring-fenced fund made available by the Secretary of State. Network Rail has taken a structured approach using RSSB's Safety Risk Model and knowledge of what has worked in CP4, to identify the projects that will give the maximum risk reduction in CP5. Network Rail's current plan to achieve the maximum risk reduction (8%) includes closing 30 high risk level crossings, fitting 200 red light enforcement cameras at crossings, and replacing whistle boards with train detection equipment at 300 high risk locations.

Conclusions - level crossings

11.50 Network Rail should provide us with its plan to maximise the reduction in the risk of accidents at level crossings in CP5 and using the ring-fenced fund, before March 2014. We expect the ring-fenced fund to be;

(a) used to deliver the maximum risk reduction irrespective of geographical location (England, Scotland and Wales);

(b) retained as a central fund; and

(c) used across the whole level crossing portfolio

11.51 The delivery of the planned package of projects in CP5, to achieve the maximum reduction in risk of accidents at level crossings using the £67m ring-fenced fund is a regulated output.

11.52 Scottish Ministers in their HLOS provided a ring-fenced fund to facilitate the closure of level crossings. Scottish Ministers want to ensure that level crossing closures achieve the maximum efficiency benefits, although they recognise that there will also be safety benefits. This Scottish level crossing fund will be managed in the same way as other specific funds provided by the Scottish Government, described in chapter 9.

11.53 The risk reduction achieved by using the ring-fenced level crossing fund is in addition to reducing risk so far as is reasonably practicable through, for example, routine risk assessment and the renewals and enhancements programmes.

Workforce health and safety

11.54 Our recent inspection work continues to show that improvements are required in Network Rail's management of workforce health and safety. Network Rail recognises this is the case and in its Transforming Safety and Wellbeing strategy it sets out a number of proposals including the development of the right safety leadership and culture.

11.55 In its SBP, Network Rail proposed three separate investments to improve the health and safety of the workforce. It proposes £100m to develop new ways to warn track workers of approaching trains, £141m for improvements to road rail vehicles and £230m for taking safer and faster electrical isolations.

11.56 These investments are reported here in our determination because safety improvements were cited as the reason for the investments. We consider the costs of

these investments go beyond Network Rail's obligations under the Health and Safety at Work Act etc.1974 and we have applied our section 4 duties under the Railways Act 1993 and amended by the Railways Act 2005, to decide the money that Network Rail requires for these items.

Track Worker Safety

11.57 Workers are required to work on or near lines where trains are running to carry out inspection and maintenance work. The number of worker fatalities as a result of being hit by a train is at an all-time low; one fatality occurred in 2009 and more recently there was a fatality in 2012. However, there have been some recent incidents when workers have been hit and survived and a number of near misses.

11.58 Where track workers work on lines where trains are running they rely on warning systems to give them enough time to get to a place of safety before the train arrives. This is commonly known as 'red zone' working. Some warning systems are automatic or semi-automatic, but it is still common for workers on the track to rely on warnings given by people (lookouts) using a flag or horn.

11.59 Track workers can be protected from being hit by trains because the line is blocked (by a signal) or separated or fenced from lines with trains running. This form of protection is commonly known as 'green zone' working. The amount of green zone working has increased in CP4 and now accounts for 70% of the hours worked on or near the line. Network Rail considers green zone working is now at the maximum level and likely to decrease proportionally to red zone due to increases in rail traffic.

11.60 Our inspection and investigation work in the area of track worker safety has found examples of poor planning and improper risk assessment by Network Rail managers and poor communications, behaviours and hazard perception by those carrying out the work. We have used formal enforcement action to secure improvements in red zone track patrolling and improvements in the design and operation of lookout operated warning systems.

11.61 We asked Network Rail to address the principal risks associated with red zone working in its SBP and it has done this in its Transforming Safety and Wellbeing strategy document. Network Rail has said it will prohibit red zone working with unassisted lookouts (people using flags and horns for example) in the circumstances with the greatest risks by 2015.

11.62 The planned improvements to red zone working and Network Rail's proposals in its SBP to have fewer people working on or near the track, through automated track inspections, remote condition monitoring and locating equipment away from the track, will improve track worker safety. In addition Network Rail is developing a new track-worker access strategy, an important part of this strategy is finding innovative and new technologies to alert track workers of approaching trains. Network Rail proposed an investment fund of £100m in its SBP to develop these new technologies.

Conclusions - track worker safety

11.63 We fully support and have been pressing for improvements in track worker safety, through for example fewer people being required to work on or near the line. Where work on or near the line is necessary then track workers should have the highest levels of protection, so far as is reasonably practicable.

11.64 We have not included Network Rail's proposal for an investment of £100m for alerts for track workers in our determination because Network Rail has not made a compelling case for this investment. Instead, and recognising the importance of track worker safety, our determination includes a ring-fenced fund of £10m for the development of new technologies to alert track workers. We will agree the governance arrangements for this fund with Network Rail before April 2014.

Road rail vehicles

11.65 Road rail vehicles are used extensively in maintenance, renewal and construction work, for lifting and moving materials and equipment. Most of these vehicles are converted for the railway from construction machines by attaching rail wheels, so they can be operated on the road and on rail. Many of these machines are used for tasks on the railway that they were not originally designed for, such as the conversion of excavators into lifting machines.

11.66 The road /rail excavator fleet has a particularly poor safety record; workers have been seriously injured or killed when machines have overturned because of their high centre of gravity or run away because of poor braking. These machines have also come into contact with overhead line equipment and have the potential to foul adjacent lines when trains are running. Investigation of accidents and our inspection work has found an underlying pattern of poor machine design and poor risk control. We have served over 20 enforcement notices on road rail vehicles in CP4 and the

industry has responded by making piecemeal improvements with layers of safety features and warning devices being fitted retrospectively.

11.67 In its SBP, Network Rail proposed a specific investment of £141m to improve the safety and productivity in five types of road rail vehicle;

(a) Mobile Elevated Working Platforms;

(b) Modular Lorries;

(c) Iveco Daily 4x4s;

(d) Mitsubishi Canters; and

(e) Lifting machines (Liftex).

11.68 We engaged independent reporters to review the proposals and their report will be published shortly. The draft independent reporter work divided the plant into two categories. The first category includes the four types of machine, listed as (a) to (d) above, this is conventional, commercially available equipment that is converted to allow it to perform with road/rail capability.

11.69 Network Rail proposed an investment of £70m for a new fleet of vehicles with an improved specification and configuration and to allow life-expired vehicles to be replaced.

11.70 The second category relates to excavators with both lifting and road/rail capability (known as Liftex). Network Rail proposed a fund of £75m to procure a specifically designed and manufactured fleet of machines to their own specification to replace the existing road/rail excavator fleet of machines.

11.71 We have included Network Rail's proposed investment of £141m as a provisional investment in our financial model, with the intention of reviewing this when we have the final independent reporters' report.

Conclusions – road rail vehicles

11.72 The draft independent reporter's report found there was a case for investment for the replacement of mobile elevated working platforms, modular lorries, Iveco Daily 4x4s and Mitsubishi Canters. The post efficient costs, for these machines will be set out in our final determination.

11.73 The draft independent reporter work found that Network Rail has not developed the design of the Liftex machine in sufficient detail to demonstrate its technical feasibility and meet the necessary safety and productivity challenges. However, there was clear potential to deliver productivity and safety improvements and so its development is worthwhile. We recognise the importance of this work from a safety and productivity perspective and our final determination will provide an investment fund for the design development work. As this is a development fund it will be less than the fund proposed by Network Rail of £75m.

Taking safer and faster isolations

11.74 The current methods for taking electrical isolations on both the DC and AC networks have not changed for many years. There is heavy reliance on procedures to control the risks of electrocution and electric shock, rather than by using safely designed equipment that allows isolations to be taken remotely. One worker has been killed or seriously injured every year since 1998 working on or near Network Rail's power systems.

11.75 When we investigate incidents we find confused isolation arrangements, poor understanding of what equipment is live and a lack of clarity about when isolations are required. Current electrical standards on the railway lag behind other UK industries and we have taken recent enforcement action to ensure compliance with the specific requirements of the Electricity at Work Regulations 1989. We have required Network Rail to review its isolation processes particularly at the design and build stage and some progress has been made.

11.76 In its SBP, Network Rail proposed an investment fund of £230m for taking safer and faster isolations in CP5. This proposal included, £127m for DC isolations in key locations in Wessex, Sussex and Kent (£100m of which is in CP5), £79m for improvements to the AC network in England & Wales, £11m for improvements to the AC network in Scotland and £40m for further unspecified DC improvements. Network Rail has cited safety improvements as the main reason for the investments.

Conclusions – taking safer and faster isolations

11.77 We are satisfied that Network Rail has made a positive case for investment, for taking safer and faster isolations of £190m on the AC and DC networks (£90m for the AC and £100m for the DC network). Network Rail did not provide a sufficient case for investment for the unspecified DC work at £40m and £27m of other investment on the

DC network was not in CP5. We have applied an efficiency assumption to the £190m investment, in line with our efficiency assumption for electrical power and fixed plant renewals. We assess efficient expenditure at £163m. We will monitor this expenditure to ensure that it delivers the required safety improvements.

Occupational health

11.78 Our recent inspection work found that Network Rail has no suitable coordinated approach to health management, particularly at route level. We found poor risk assessment and lack of appropriate controls on site. Network Rail acknowledges that historically occupational health issues have not been managed systematically and consequently Network Rail does not have sufficient data to provide an accurate assessment of where it is now or what it should focus on in the early part of CP5. Network Rail is in the early stages of formulating a health and wellness strategy, which will identify the key issues.

11.79 Poor management of occupational health issues has a detrimental effect on the individuals who suffer ill-health and it creates inefficiencies and costs within organisations. The HSE Labour Force Survey found that rail workers report higher incidents of ill-health, 40% higher than the all industry figure and 18% higher than construction workers. There were more appearances in GP and consultant clinics for musculoskeletal disorders and mental health complaints than would statistically be expected for the size and nature of the rail industry. RSSB estimates that occupational ill-health costs the rail industry between £109m and £163m per annum; and that 1.17m working days were lost through ill-health in 2005.

11.80 In the absence of information from Network Rail, we carried out some research, literature reviews and case studies and attempted to quantify the costs of inefficiency in occupational health, including those associated with ill-health. We considered what good practice looks like, what processes support good practice and their associated costs and estimated likely efficiency savings.

Conclusions – occupational health

11.81 In light of our research we have, currently, applied a conservative increase to our overall efficiency estimates of approximately 0.07% per annum across Network Rail's support, operations, and maintenance, renewals and enhancements costs to reflect the savings which could be achieved through improvements in occupational health.

This amounts to approximately £20m of savings in the final year of CP5. Further detail is provided in chapter 4.

11.82 We will continue to push Network Rail to formulate and implement its health and wellness strategy and we expect this to be ready for use at the start of CP5.

Network Rail's strategy for safety and wellbeing

11.83 For the first time Network Rail has set out a strategic direction for health and safety in the Transforming Safety & Wellbeing document, with the intention by 2019, of '*eliminating all fatalities and major injuries and reducing train accident risk by 50%*, and a longer term vision of '*everyone goes home safe every day'*. The strategy document was published in November 2012 and covers two control periods to 2024.

11.84 In our assessment, the strategy addresses the known health and safety risks and behavioural issues, but plans to deliver the strategy are still being developed or are in the early stages of implementation. We will discuss with Network Rail the processes it intends to use to measure, audit and review the effectiveness and success of its new strategy.

Indicators and enablers

11.85 We will continue to assess Network Rail's health and safety management performance in CP5, through our inspection and audit work and we will continue to use our rail management maturity model as a benchmark for the capability of Network Rail to manage health and safety.

11.86 We will continue to monitor Network Rail's health and safety performance by tracking the full range of information and data provided by Network Rail and the wider rail industry, including RSSB. In particular, we will monitor;

(a) Network Rail's implementation and delivery of its safety and wellbeing strategy;

(b) the current PIM or any revision of it; Network Rail is working with RSSB to make sure the PIM is robust with a specific version for Network Rail operations, so it can be used to assess and track the risks from Network Rail's activities, and

(c) that Network Rail achieves European Common Safety Targets as required by the HLOS.

11.87 Where we have any concerns about Network Rail's health and safety performance and compliance with the law we will continue to use our regulatory tools and legal powers in accordance with our health and safety enforcement policy.