Will Godfrey
Director, Economics, Finance & Markets

Conrad Bailey
Director General, Rail Services and Strategy
Department for Transport (DfT)
Great Minster House
33 Horseferry Road
London, SW1P 4DR
(By email)

16 September 2022

Dear Conrad

ORR's second supplementary advice to the UK Government on the development of its High-Level Output Specification (HLOS) and Statement of Funds Available (SoFA)

I write further to the advice we sent on 26 May and the supplementary advice we provided on 8 July.

In this letter, and the supporting reports, we provide further supplementary advice in relation to Network Rail's plans for Control Period 7 (or CP7). We also summarise the overall conclusions from our advice, building on and reflecting our previous reports to the Minister. This is intended to help conclude the UK Government's decisions on the England & Wales HLOS and SoFA.

As you are aware, the PR23 process will determine the level of funding Network Rail (or, in future, Great British Railways) should receive for its infrastructure operations and what, in return, it should be required to deliver over five years from April 2024. This centres on Network Rail's operations, support, maintenance, and renewals (OSMR) activities and excludes the delivery of large-scale enhancements which are funded under separate arrangements.

As part of this process, Network Rail has been developing its CP7 plan through staged iterations. Its March 2022 submission focused on Network Rail's delivery under a 'steady state' funding level of around £43.2bn. It also considered certain options to reduce spend for CP7 which, if taken together, amounted to around £39.4bn (the 'reduced cost' funding scenario). Since then, Network Rail has focused on the 'reduced cost' funding scenario and the implications of decrements to this spend level. As such, and making use of additional information from Network Rail, this supplementary advice focuses on the 'reduced cost' funding level. By way of comparison, spend for the current control period (CP6) is expected to be around

£37.2bn. Note these figures are in 2023-24 prices using the November 2021 Bank of England (BoE) forecasts for consumer price index (CPI) inflation.

Key findings from this supplementary advice

Our advice in supporting documents A and B cover four separate areas, which we discuss under sub-headings (1) to (4) below.

1) Network Rail's CP6 delivery

There are risks with Network Rail's delivery in CP6 that may have implications for the funding that is needed for CP7 delivery. For the purposes of the UK Government's SoFA and HLOS decisions, this highlights the risks of reducing funding below the 'reduced cost' funding scenario.

Across Great Britain, Network Rail expects that rising inflation could cost an additional £51m for the reminder of CP6 (compared with June 2022). It is also facing additional costs [Redacted] if there are further delays to implementation of its workforce modernisation programme. This is important for CP6, but also for CP7 as Network Rail is assuming that workforce reform will be fully delivered during CP6.

These issues are exacerbated by limited remaining risk funding in CP6 in England & Wales (£232m), compared with a total of £2.7bn we allocated through our periodic review 2018 (PR18) Final Determination for England & Wales.

Our review is based on Network Rail's updated plan as of June 2022 and further issues (or mitigations) may have arisen since then that could impact Network Rail's position with respect to its CP6 delivery.

The figures quoted above are in cash prices, which include a forecast based on the Bank of England (BoE) May 2022 CPI forecasts.

2) Network Rail's HS2-related work

As part of its initial CP7 submission, Network Rail proposed £1.2bn of renewals funding related to HS2 on the West Coast Mainline North of Crewe ('WCML North'). We consider that reducing spend on HS2-related work in CP7 adds to the whole-life costs and is likely to be counter-productive, as it jeopardises future train performance and the reputation of HS2 services.

We consider that commencing the full programme of WCML North renewals in CP7 represents the optimal approach. This would significantly reduce the total cost of delivering this work and would mitigate performance impacts on planned HS2 services in CP8.

Network Rail estimates the cost of the renewals programme as £1.2bn. However, this is contingent on a detailed deliverability assessment and the cost of works

realistically deliverable within CP7 is likely to be lower, which could justify lower levels of CP7 funding. There are also wider uncertainties with respect to the HS2 programme that may affect the level of CP7 funding required for Network Rail's HS2-related renewals works.

Should the UK Government choose to defer some of these works (potentially around £0.5bn) to CP8 and CP9, the cost is likely to increase from £0.5bn to more than £1.1bn. This would require significant disruptive access and would increase performance risks for newly introduced HS2 services in CP8, potentially impacting HS2's business case and reputation.

The figures quoted above are also in 2023-24 prices using the November 2021 BoE CPI forecasts for inflation.

3) Network Rail's analysis on the implications of maintenance costs under a 'reduced-cost' funding scenario

Reduced renewals funding under the 'reduced cost' funding scenario will increase maintenance costs, though this is likely to be small when considered against the whole Network Rail CP7 plan. However, the impact will be more significant in CP8 and CP9, even if funding was to increase to a 'steady state' level.

Under the 'reduced cost' funding scenario and compared with 'steady state' funding, Network Rail indicated that maintenance costs would need to increase by £0.3bn-£0.5bn in each of CP8 and CP9 (compared with £9.3bn on maintenance spend in CP7 under the 'reduced cost' funding scenario). It agreed to undertake further work to consider this in more detail.

Based on this analysis, and although we agree with Network Rail's conclusions that there is likely to be an additional maintenance requirement under the 'reduced cost' scenario, we consider that the impact is likely to be felt most in later control periods (potentially up to the £0.5bn in both CP8 and CP9, as Network Rail estimates). However, our view is that it is likely that only a small increase for maintenance costs will be required in CP7, as it may be possible to cover large elements of the impact within current plans.

We understand that options are also being explored for funding below the 'reduced cost' level. This would require Network Rail to defer yet more renewals from CP7, which is likely to lead to more asset failures and additional maintenance costs in CP7. This reflects that (other things being equal) the greater the reduction in renewals activities, the greater the requirements are for maintenance activities. In this scenario, it is likely that expenditure on both renewals and maintenance activities would need to increase significantly in later control periods.

The figures quoted above are also in 2023-24 prices using the November 2021 BoE CPI forecasts for inflation.

4) Network Rail's CP7 digital signalling plans

Digital signalling is critical to the future modernisation of the GB rail network. Fleet fitment is an important enabler of digital signalling and, as such, needs to be funded to align with the renewals programme. Potential savings of £200m in CP7 for passenger fleet fitment would be likely to incur much greater costs in future control periods and could delay the deployment of digital signalling.

Network Rail's initial CP7 submission included around £2.2bn (at a GB-wide level) to support the deployment of digital signalling. This included expenditure for signalling renewals (£0.7bn), as well as £1.2bn on fleet fitment (which is separate to Network Rail's OSMR activities), R&D (£0.2bn) and enablers for European Train Control System (ETCS, which refers to the wider signalling and control system for digital signalling and amounts to £0.1bn). Since then, Network Rail has provided us with updated project cost forecasts.

While Network Rail is currently proposing £0.7bn to commence digital signalling renewals in CP7, we note that these costs are not fully assured, and that Network Rail will need to provide more certainty on costs for our SBP review and scrutiny next year.

While fleet fitment costs are separate from Network Rail's OSMR costs (as noted above), Network Rail has also included £1.2bn for fleet fitment in CP7. While we have not assured these costs (reflecting our understanding of DfT's expectations for this advice), we consider that there is a strong case for including a level of funding for CP7 fleet fitment that aligns with the wider programme for signalling renewals. However, further consideration needs to be given to the operational reasons for having such an extensive fleet fitment programme in CP7 and the deliverability risks this presents, especially given the existing deliverability issues with the fleet fitment programme in CP6.

Furthermore, we are not convinced that Network Rail's proposal to reduce passenger fleet fitment expenditure by around £200m in CP7 is appropriate as it could impact digital signalling renewals volumes, leading to the industry incurring costs in future control periods much greater than the £200m saved in CP7.

We also note that further work is required between the UK and Scottish Governments on the allocation of some of the costs between England & Wales and Scotland, including with respect to fleet fitment costs, ahead of the SoFA documents being finalised. We will continue to work closely with both funders (and Network Rail) in this respect.

The figures quoted above are in 2023-24 prices, though are made up of some costs that use the November 2021 forecasts and some costs that use the May 2022 forecasts.

Basis of information provided to date

While the additional information Network Rail has provided to us has been a helpful contribution to the development of a CP7 plan, the forecasts are indicative and high-level. Furthermore, and as noted above, Network Rail has presented them to us in different price bases that do not reflect a recent and/or consistent forecast for CPI inflation. There are also some interdependencies and associated impacts between the areas that Network Rail has not always considered (e.g. the scale of maintenance activities may affect renewals requirements relating to HS2-related work and/or digital signalling, and vice versa).

Going forward, it is important that Network Rail's next and full iteration of the plan (the Strategic Business Plan (SBP), which we expect to receive in February 2023) addresses these issues and, more generally, meets our July 2022 guidance to Network Rail. Network Rail's forecasts should, for example, be based on a consistent price base using the BoE's forecast for CPI inflation.

Conclusions from our overall PR23 advice on CP7 funding and outputs

Our view is that funding at or around the 'reduced cost' level for CP7 of £39.4bn is likely to represent a manageable level of spend for CP7 across Network Rail's activities, though it would give rise to significant consequences for the required level of spend in future control periods. This could potentially amount to an additional £5bn in both CP8 and CP9 compared with the 'steady state' funding level of £43.2bn.

At the same time, we recognise the UK Government's decisions are being made in the context of difficult economic conditions and that it will need to consider what is affordable now alongside the longer-term needs of the network.

More specifically, we suggest that the UK Government takes the following factors into account in developing its HLOS and SoFA decisions:

- It is more efficient over the longer-term to manage the assets on a lowest cost whole-life basis, though there is a choice about whether (and when) funding for assets should be provided.

- Notwithstanding the longer-term implications, the 'reduced cost' funding scenario is unlikely to unduly impact the condition of the network or give rise to undeliverable volumes of work in CP7.

- Without other mitigations in place (e.g. increased levels of traincrew and response staff), there are increased risks to future passenger and freight performance (i.e. punctuality and cancellations) that we consider Network Rail

has underestimated. We discuss this in more detail in our July supplementary advice.

- There are risks Network Rail may not fully deliver against its CP6 commitments (particularly in Scotland), which would have knock-on impacts on what can be delivered (and funded) in CP7. This is exacerbated by rising and uncertain inflation.

- Any funding below the 'reduced cost' level in CP7 (and beyond) is likely to exacerbate the performance and future cost issues noted above, as well as having potential implications for asset condition and safety.

- Network Rail will need to look across its activities to decide on relative priorities once the UK Government (and Scottish Ministers) have issued their HLOS and SoFA documents. This may require Network Rail to make new trade-offs about its proposed delivery, which could represent a change in what it has proposed in its CP7 submissions to date.

Interactions with other areas of work

Scottish Ministers will need to produce their own HLOS and SoFA documents and, as such, we are also providing advice to them on CP7 outputs and funding. For the purposes of this supplementary advice, we are providing the same analysis to Scottish Ministers as we set out herein, with two key exceptions:

- Network Rail's HS2-related work to Scottish Ministers, which we have not provided our advice on as that part of the network is in England; and

- The implications of 'reduced cost' funding on maintenance costs, which we are providing different advice on to Scottish Ministers. This reflects that Network Rail's proposed maintenance costs in England & Wales and Scotland are different.

Furthermore, we note that Network Rail is working with the DfT and HM Treasury on some separate but related questions regarding CP7 outputs and funding. While we are not providing advice on that work in this letter (reflecting our understanding of the DfT's expectations), we will, where relevant, share our views with the DfT team in due course.

Next steps

In addition to the work discussed above, we have been reviewing Network Rail's proposed CP7 expenditure on the System Operator and National Functions, which includes business units such as corporate functions (e.g. group HR). Reflecting that both the UK and Scottish Governments contribute towards these costs, we will

provide this advice to both you and Scottish Ministers (as well as Transport Scotland) at the same time. We expect to do this shortly.

As set out in previous correspondence (including as part of the formal notices to commence the periodic review that we provided to you in June), we are expecting to receive the UK Government's HLOS and SoFA by 28 October. We look forward to continued close engagement with your team on this (and with wider government, as necessary) in order to facilitate a timely conclusion to the HLOS and SoFA.

We intend to publish this letter (alongside the previous formal advice we have provided to you) at an appropriate time, likely to be after your HLOS and SoFA are published.

Yours sincerely

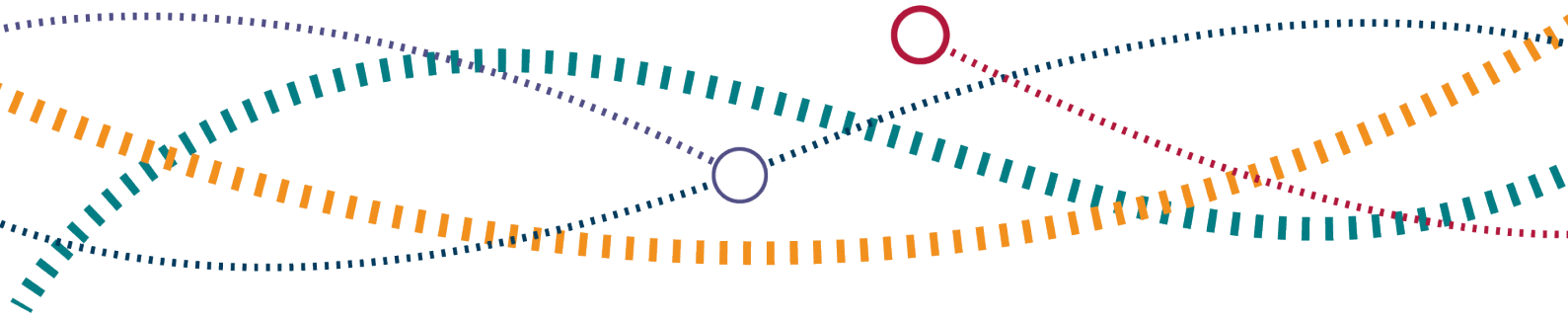
Will Godfrey
Director, Economics, Finance and Markets

cc. Andrew Haines, Chief Executive, Network Rail

Supporting document A: Second supplementary advice

Periodic Review 2023 (PR23)

16 September 2022



Contents

Chapter 1: Introduction

Background

1.1 This document sets out our more detailed advice to the Department for Transport (DfT) in the following three areas:

a. Network Rail's delivery of its Control Period 6 (CP6) commitments;

b. Network Rail's proposals to support HS2-related work on the West Coast Mainline, north of Crewe ('WCML North'); and

c. Network Rail's analysis for the implications of maintenance costs under a 'reduced cost' funding scenario.

1.2 It is part of our second supplementary advice on Network Rail's control period 7 (CP7) funding and delivery. It should be considered alongside our separate supporting document ('Supporting document B') on our findings with respect to Network Rail's digital signalling plans, as well as our overarching letter that summarises our overall advice.

1.3 This work complements the initial advice we provided on 26 May on Network Rail's overall approach to CP7, based on our review of its March 2022 initial CP7 submission.

1.4 It is being undertaken as part of our PR23 work to advise the UK Government on its decisions relating to the funding Network Rail should receive for its infrastructure operations in CP7 and what, in return, it should be required to deliver. CP7 will run for five years from 1 April 2024. Governments' decisions (and, in turn, our determination) will focus on Network Rail's operations, support, maintenance, and renewals (OSMR) activities. It will not include (for example) decisions on large-scale enhancement projects, which are funded under separate arrangements.

1.5 The UK Government will set out its decisions through a High-Level Output Specification (HLOS) document and a Statement of Funds Available (SoFA) document, which we expect to receive in the coming weeks. Alongside this work, we are also advising Scottish Ministers in advance of their decisions on the funding and delivery of Network Rail's CP7 activities in Scotland. Further information on the wider process, including our role, is set out in our March 2022 guidance on how Network Rail's funding and outputs and determined.

The funding assumptions used

1.6 As noted above, our May advice was based on our review of Network Rail's March 2022 initial CP7 submission. This submission focused on Network Rail's delivery under a 'steady state' funding level of around £43.2bn. It also considered certain options to reduce spend for CP7 which, taken together, amounted to around £39.4bn (the 'reduced cost' funding scenario). This compares with £37.2bn of spend for the current control period, CP6. These figures are in 2023-24 prices using the November 2021 Bank of England (BoE) forecasts for consumer price index (CPI) inflation.

1.7 However, since its March submission, Network Rail has developed its core CP7 plan around the 'reduced cost' funding scenario. As such, the submissions it has provided us in support of the three areas discussed herein – and, in turn, this supplementary advice – centres around the 'reduced cost' funding scenario.

Network Rail's additional information

1.8 In line with the commitment made as part of our May advice, Network Rail provided us with additional information to inform this supplementary advice. This has been a helpful contribution to the development of a CP7 plan. However, there are certain limitations with the information:

a. Network Rail's figures used to inform this supplementary advice are indicative and high-level (with the exception of the figures cited on CP6 delivery, which are based on more detailed updates to its CP6 plan). This reflects that Network Rail has focused on updating its analysis from the March 2022 initial CP7 submission (rather than, for example, developing new 'bottom-up' forecasts of costs based on workbanks).

b. Network Rail has presented its forecasts of CP7 costs to us in different price bases that do not reflect a recent and/or consistent forecast for CPI inflation. We explain below the price base Network Rail has used (and which, in turn, we cite). However, as Network Rail acknowledges, this creates confusion and risks inconsistent interpretation around what Network Rail means by '2023-24 prices'.

c. There are some interdependencies and associated impacts between the areas this advice considers, which Network Rail has not always considered. For example, the scale of maintenance activities may affect renewals requirements relating to HS2-related work and/or digital signalling, and vice versa.

1.9 These issues reflect the stage at which Network Rail is developing its plan. However, going forward, it is important that Network Rail's next and full iteration of the plan (the Strategic Business Plan (SBP), which we expect to receive in February 2023) addresses these issues and, more generally, meets our July 2022 guidance to Network Rail on the preparation of its SBP. Network Rail's forecasts should, for example, be based on a consistent price base using the BoE forecasts for CPI inflation.

Chapter 2: Network Rail's CP6 delivery

Background

2.1 This chapter provides our views on Network Rail's CP6 delivery, based on its latest (June 2022) update to its CP6 plan. We are setting out our views in this area given that any risks or issues with Network Rail's delivery in CP6 will have an impact on the use of Network Rail's CP7 funding and its associated delivery.

2.2 Network Rail updates its OSMR delivery plan for CP6 regularly. We review these updated plans to help hold Network Rail to account against the Periodic Review 2018 (PR18) Final Determination, as well as to provide assurance to funders about Network Rail's delivery. The conclusions set out herein draw on our review of Network Rail's update of its plan in March 2022, the findings of which we set out in our letter to the DfT and Transport Scotland on 29 March 2022.

2.3 Network Rail's latest plan sets out what it is forecasting to deliver and its income and expenditure forecasts for the remainder of 2022-23 and for 2023-24. All figures in this chapter are in cash prices, which include a forecast based on the BoE May 2022 CPI forecasts.

2.4 Reflecting our findings from our March 2022 review, we have focused on four areas:

a. Network Rail's risk funding;

b. the impact of rising inflation on Network Rail's income and costs;

c. renewals profiling; and

d. Network Rail's workforce modernisation plans.

High–level summary of our findings

2.5 While we consider that Network Rail's activities in England & Wales remain on track to deliver, we have more serious concerns about Network Rail Scotland's ability to deliver against its CP6 commitments. We have identified several significant (and related) issues that could compromise Network Rail's ability to deliver on its CP6 commitments:

a. **Network Rail has undertaken further deferrals of renewals from year 4 to year 5 of CP6 in its latest update of its CP6 plan (June 2022), which has increased our concerns that it will not deliver these projects in CP6.**

   This is particularly concerning in Scotland where Network Rail is forecasting to under-deliver on its year 4 effective volumes (which reflect how much additional life renewals activities add to assets, thus providing a view on asset sustainability) across all asset types. Network Rail has advised us that it is reporting under-delivery for several reasons, including deferrals of works and changes to the type of work (or intervention) being undertaken. There were also errors in its original year 4 budget, which has caused some of the variance.

   In England & Wales, Network Rail is on track to deliver its planned volume of work in CP6, although it has deferred work into year 5 of CP6. This is mainly due to issues relating to the delivery of works, including (for example) supply-chain underperformance in signalling, labour shortages and poor reliability of specialist plant.

b. **Rising inflation is expected to cost Network Rail an additional £51m (compared with its March submission) for the reminder of CP6.**

   This reflects the latest BoE forecast based on the August 2022 annual CPI inflation rate of 13.1%.

c. **Network Rail's remaining risk fund (£252m, in June 2022) will need careful management to ensure there is enough funding in CP6 to deliver its outputs.**

   The position is especially acute in Scotland. For example, in June 2022, Network Rail Scotland is forecasting it has only £20m of unallocated risk funding remaining, yet it has identified £45m of known risks, as well as several additional emerging risks that it has not yet quantified. While it is looking into options for a potential change to its budget to enable it to avoid deferrals (see above), this remains uncertain.

d. **[Redacted]**

   The latest update of Network Rail's plan assumes full benefits of the workforce modernisation programme will be delivered by July 2023, which is later than the original date of April 2023. Further delays beyond July 2023 would reduce the overall net benefit in CP6 [Redacted].

[Redacted] Network Rail's initial CP7 submission assumes that workforce reform is fully delivered during CP6. The savings are also an important part of planned CP7 efficiencies.

Our review of Network Rail's CP6 delivery

2.6 We set out below five key observations which we consider that funders should take account of in developing their CP7 HLOS and SoFA.

Further deferrals of renewals

2.7 In March 2022, we raised concerns about the increased backend loading of renewals. This creates risks that some of these schemes will not be completed in CP6 and/or would need to be deferred to CP7, putting additional funding pressures on CP7.

2.8 Network Rail remains committed to delivery of its CP6 commitments and, in England & Wales, Network Rail is on track to deliver its planned volume of work in CP6. However, Wales & Western has moved several structures and buildings renewals into year 5 of CP6. In addition, North West & Central and Wales & Western have moved some of their track renewals into year 5 of CP6.

2.9 Furthermore, on track renewals, we are observing a shift from full refurbishment to lower impact interventions, which is likely to mean that the next intervention will be required sooner than planned. This could result in a higher whole-life cost than would otherwise have been the case. This is especially the case in Scotland and is likely to impact on the Network Rail Scotland's ability to deliver its CP6 efficiency commitments. Failure to deliver its efficiency plans is likely to exacerbate the funding challenges highlighted above.

2.10 In March 2022, we asked Network Rail to provide us with assurance over its ability to deliver its planned renewals in CP6. Whilst Network Rail's Technical Authority (which provides technical assurance over the regions' activities) has undertaken a review that indicates that the volume of renewals currently being forecast for delivery in years 4 and 5 of CP6 is technically deliverable, there are some concerns that deferrals into CP7 will occur, especially in telecoms, structures and signalling. A more in-depth review is being undertaken by Network Rail's Capital Delivery Centre of Excellence team, which will start in October 2022 and is due to conclude in January 2023. This aims to provide further insights into the preparedness of regions to deliver, to provide a basis on which to judge delivery confidence and provide the clearest forecast of the exit CP6 position.

2.11 The largest movement in renewals volumes has been in Scotland where Network Rail Scotland has reported that it is forecasting to under-deliver on its year 4 effective volumes budget across all asset types by between 9% and 16%. The original budget set for year 4 was incorrect, which has caused part of this variance. There are also deferrals of works and changes to the types of interventions being undertaken which further explain this variance. We consider this shortfall may be the result of poor governance and assurance and we have escalated these concerns to Network Rail Scotland's executive. We are closely engaging with Network Rail Scotland to understand how it will make improvements to ensure that future reporting accurately reflects planned delivery. We are concerned that any under-delivery in year 4 will impact on its overall CP6 delivery. It may also impact on CP7 if renewals are deferred into CP7. This potential under-delivery will further negatively impact its Composite Sustainability Index (CSI) in CP6, which shows the percentage improvement of asset sustainability compared to a baseline (the CSI value measures the cumulative change against the start of CP5).

2.12 In March 2022, following Network Rail Scotland's decision to defer £53m of planned renewals, we reported that it was forecasting a CSI of 2.2% by the end of CP6 and, as of July 2022, this is now forecast to be 2.0%. This is below Network Rail Scotland's target of 2.9% and our regulatory floor of 2.4%. In practice, this means that Network Rail Scotland is not delivering sufficient renewals to achieve the levels of asset sustainability, as measured by CSI, that it agreed to in the PR18 Final Determination. This will have implications for train and freight service performance and future funding, as Network Rail Scotland's declining CSI measure will also impact on its CP7 plans as well as future control periods.

2.13 We have stepped up our monitoring on Network Rail Scotland's CSI measure and wrote to Network Rail Scotland about this in June 2022. This letter outlined a series of mitigations that Network Rail Scotland was undertaking, and we have further discussed these mitigations with the regional executive. It confirmed that it will continue to target its renewals in the most appropriate locations to maintain a safe and sustainable railway. We support this approach. However, given the additional forecast under-delivery, we have requested an updated forecast for CSI at the end of CP6 to better understand the implications on long-term asset sustainability, which we expect to receive in October.

2.14 We consider that Network Rail Scotland's significant shortfall against its budgeted renewals for year 4 may be the result of poor governance and assurance of the CP6 re-forecasting process. We have escalated these concerns to Network Rail Scotland's executive and are closely engaging with it to understand how it will make improvements to ensure that future reporting accurately reflects planned delivery. We

will provide a further update on this issue and the CSI forecast in our next review of Network Rail's plans towards the end of the year.

Rising inflation

2.15 Inflation is currently high – the CPI inflation rate rose by 9.9% in the 12 months to August 2022. This is a key concern for Network Rail and its forecast costs have risen by net £51m since Network Rail's update of its CP6 plan in March 2022. As of June 2022, the impact of high inflation for Network Rail over the remainder of CP6 is expected to cost a further £51m. Network Rail's own modelling suggests that, if CPI was 1% lower than forecast, the additional cost for CP6 would (only) be £31m. It should be noted that the impact of CPI on Network Rail's costs is not straightforward, however. For example, some of Network Rail's costs will increase in line with inflation, while other costs will be fixed.

2.16 The uncertainty around inflation has been included in Network Rail's risk modelling. However, as discussed below, there is limited risk funding available to absorb any further increases in inflation (or any other cost shocks).

Network Rail's remaining risk fund

2.17 The remaining risk fund for Network Rail in CP6 is now £252m. This represents around 60% (or P60) of potential risks according to Network Rail's risk modelling. This is lower than the risk coverage at the start of the control period (P80). The £252m remaining risk funding is for risks that could materialise in years 4 and 5 of CP6.

2.18 Some of the key risks for Network Rail are difficult to predict, including rising inflation (discussed above); industrial action [Redacted] and issues relating to the funding of the wider rail industry (e.g. whether DfT wants Network Rail to assist with TOC financial difficulties). We are concerned that Network Rail will need to defer renewals if the risk fund is not carefully managed over the remainder of CP6. This is exacerbated by the issues discussed below.

2.19 We are particularly concerned about the level of remaining risk funding in Scotland, which we discussed in our June advice to Scottish Ministers. The final RF11 risk position in Scotland was £34m. Since then, Network Rail Scotland has completed an exercise to provide more detail to us and to Transport Scotland on its use of the risk fund to date in CP6 and the risks it anticipates needing to fund with the unallocated balance remaining. The net impact is that, as of June 2022, Network Rail Scotland is forecasting it has only £20m of unallocated risk funding remaining. This compares

with £45m of known risks, and several emerging risks, which Network Rail Scotland has not yet valued.

2.20 The forecast risks in Scotland are extremely uncertain given, for example, the risk fund's dependency on delivery of operational savings (identified through, for example, on-going modernisation plans) and Network Rail Scotland's poor delivery of efficiencies in year 3.

2.21 Network Rail Scotland has identified the renewals it will defer to increase risk funding to manage these risks. However, it is now discussing [redacted] to avoid the deferrals, which will enhance asset sustainability and avoid inefficient spend.

2.22 The on-going uncertainty and limited risk funding makes effective planning more challenging for Network Rail Scotland. It is investing a lot of resource in revising its plans and, at the same time, undertaking significant work to plan for CP7. Successful management of both of these priorities will be challenging. We have previously said to Network Rail that it needs to strike a balance between using risk funding to address cost increases that have already happened, making sure there is enough risk funding to cover future risks and not leaving unused risk funding to the end of the control period. We recognise that getting this balance right is difficult and that the CP6 risk funding process has provided some stability to the planning process.

Industrial action and workforce reform

2.23 Network Rail's CP6 plans include the cost of a pay award (which is consistent with its latest negotiating position), though this is still being negotiated and could change. Network Rail has said that any increases to the current assumption would have to be funded from additional efficiencies, which may be challenging.

2.24 The maintenance reform workstream is high risk, especially given the current trade union action. Network Rail's latest plan includes the costs of any strike action up to 20 August 2022. [Redacted].

2.25 Network Rail's latest plan assumes full benefits of the workforce modernisation programme will be delivered by July 2023, which is later than the original date of April 2023. Network Rail has told us that the overall net benefit in CP6 would reduce [Redacted].

2.26 In March 2022, we outlined that we are monitoring progress on Network Rail's workforce modernisation plans to ensure that it is not compromising on efficient and

safe delivery. In its latest update, we did not receive a detailed update on this from Network Rail. We still have some concerns that Network Rail has not fully explained how it will monitor the impact of these plans on its wider commitments to asset management, safety and train performance. We will consider this issue in our next review of Network Rail's plans.

2.27 The workforce reform programme is important, not just for CP6, but also for CP7. Network Rail's initial CP7 submission assumes that workforce reform is fully delivered during CP6 and the savings are an important part of planned CP7 efficiencies. We are monitoring this closely and will provide a further update on the risks to its workforce modernisation plans at our next review of Network Rail's plans.

Use of budgetary flexibility in England & Wales

2.28 Network Rail is forecasting increased costs in 2022-23, primarily due to the impact of industrial action. This will mean an increase in total Resource Departmental Expenditure Limit (RDEL) costs for the year. Network Rail is planning to manage this partly by drawing down on provisions set aside for this eventuality, as well as utilising forecast headroom in the enhancements budget. This will be reversed next year, with an increase in enhancements expenditure funded through resource spending. The effect of this overall should be minimal – being a timing issue and a switch between budgets.

2.29 In addition to this, Network Rail is concerned that it will not be able to use the agreed budgetary flexibility rules to move funding from this year to next, including that forecast underspends in the capital delivery (e.g. renewals) budget is not allowed to be carried forward to 2023-24. Network Rail has forecast the impact of this at £40m.

Next steps

2.30 As set out in this chapter, we have significant and related issues regarding Network Rail's delivery of its CP6 commitments. We will continue to monitor Network Rail's delivery in CP6, including by way of a fuller review of Network Rail's updated CP6 plans in October/November 2022. As part of this, we will provide a formal assurance review to funders of Network Rail's update of its plans, including the areas we would expect it to focus on (or, if necessary, revise) in advance of agreeing the formal update of its plans.

Chapter 3: Network Rail's HS2-related plans for CP7

Background

3.1 This chapter sets out our further views on Network Rail's plans for renewals on WCML North, which affect readiness for the planned introduction of HS2.

3.2 We provided our initial advice to the UK Government on Network Rail's plans in this area as part of our May advice. As well as reviewing Network Rail's March 2022 initial CP7 submission, we also took account of the findings from our December 2021 Targeted Assurance Review on the impact of HS2 on Network Rail's planned work in CP6.

3.3 Network Rail's initial submission included £1.2bn of renewals for WCML North, made up of £0.7bn of renewals within the 'steady state' submission and a further £0.5bn of renewals categorised as a 'core option'.

3.4 In our May 2022 advice, we highlighted that:

a. Network Rail's programme of works on WCML North will span CP7, CP8 and beyond and will interact with planned HS2 services on this part of the network.

b. The £0.7bn relates to signalling and other assets which are life-expired.

c. The £0.5bn relates to signalling and other assets which are also life-expired, but which Network Rail indicated could potentially be maintained through CP7 and renewed later, in CP8. However, Network Rail provided insufficient information in this area, so we requested additional information to understand the condition and criticality of these assets.

3.5 Network Rail notes that delaying this £0.5bn of renewal activities until CP8 creates significant performance risks to HS2 services, with financial and reputational impacts shortly after the HS2 services start running. Again, insufficient information was provided in the initial submission and we requested additional details.

3.6 We considered that Network Rail's plans were still in an early stage of development and further analysis was needed to quantify these costs and risks, so that the UK Government can make more informed decisions.

3.7 All numbers in this chapter are in 2023-24 prices using the November 2021 BoE CPI forecasts for inflation.

Progress since May 2022

3.8 Since our initial advice, Network Rail has secured funding to proceed with its detailed Outline Business Case (OBC) for the WCML North programme and it is progressing with its detailed analysis. The OBC is not expected to be complete until mid 2023 and Network Rail will not have accurate estimates of the costs and risks until that time.

3.9 However, we have requested additional information from Network Rail to understand (as accurately as possible based on the information available) what is driving costs and risks, and to establish their relative magnitude. While there is still uncertainty in these estimates (pending maturation of the OBC), we now have sufficiently clear information to provide meaningful advice in this area.

High-level summary of our findings

3.10 As set out in our initial May 2022 advice, we said that that there is a strong case for including the £0.7bn of renewals expenditure (relating to track and signalling renewals and now presented as part as 'core work') as part of the overall funding. We consider this to still be the case. We would advise against two of the scenarios put forward by Network Rail, which would not include expenditure on these renewals, based on significant inefficiencies and increased risk to safety and performance (these are referred to as Scenarios 3 and 4 below).

3.11 Including the full £1.2bn for renewals in CP7 in its overall expenditure (referred to as Scenario 1) represents the lowest whole-life-cost approach and removes significant financial and performance risks from CP8 and beyond. However, this would require £0.5bn more renewals funding in CP7 (compared with the £0.7bn alone) and we recognise the affordability challenge this presents. Furthermore, if the UK Government chooses to fund this level of renewals, it should be aware of the risks to delivering the CP7 outputs. This includes:

a. The detailed plans for how Network Rail and its supply chain will deliver these works are still in development.

b. There is a wider, pre-existing risk to delivery of the European Train Control System (ETCS, which refers to the wider signalling and control system for digital signalling) cab fitment programme, which would need to make sufficient progress

in CP7 to realise the full benefits of the £1.2bn CP7 funding over the longer-term; and

c. There is wider uncertainty around the HS2 programme.

3.12 However, we consider Network Rail can manage these risks through its existing programme management processes. We also monitor these activities through our business-as-usual activities, and we would escalate and attempt to resolve any issues that may arise.

3.13 Funding only £0.7bn out of the total £1.2bn and deferring the remainder to CP8 and CP9 (referred to as scenario 2) gives rise to certain risks and inefficiencies within CP7. These are not optimal but could be tolerable if Network Rail puts in place reasonable mitigations. However, if the UK Government chooses to fund this scenario, it will need to take account of the significant additional costs and risks (financial and reputational) in future control periods, notably:

a. This scenario is certain to require significant additional funding in CP8 and future control periods. This includes at least the £0.5bn to complete the remaining renewals, but also additional funding to cover inefficiencies and reactive works from prolonging the life of the assets through CP7 (likely to be more than £0.1bn);

b. This scenario introduces a significant risk to the performance of planned HS2 services. While we cannot quantify this risk with certainty at this time, the additional cost is likely to be greater than £0.5bn (this is a lower bound estimate, given the disproportionately high cost of delays to a new, high-speed service).

c. Overall, the £0.5bn saving on renewals in CP7 is likely to result in costs in excess of £1.1bn across CP8 and CP9. There are also safety and performance risks to delaying renewal of life-expired assets and reputational risks from delays and passenger inconvenience on the planned HS2 services.

Information provided by Network Rail: four scenarios

3.14 As noted above, we challenged Network Rail to provide a full breakdown of the proposed expenditure (including the £0.7bn and £0.5bn renewals costs) and to provide a clear articulation of the performance and financial risks in CP7, CP8 and beyond.

3.15 Network Rail set out the full list of renewal works which need to be completed on the WCML North programme between CP7 and CP10. This is shown in Table 3.1 (timing of these renewals is discussed later).

Table 3.1 Break-down of renewals activities*

Renewals	Total ("£1.2bn")	Included in "£0.7bn"
Crewe area: track, re-signalling, electrification & fixed plant (E&P), level crossings and station canopies	c.£0.44bn	c.£0.32bn
Warrington: re-signalling	c.£0.15bn	c.£0.15bn
Preston: re-signalling	c.£0.17bn	
Carlisle: re-signalling	c.£0.15bn	
Other re-signalling (Winsford Weaver)	c.£0.06bn	c.£0.06bn
Traction power renewals	c.£0.13bn	c.£0.05bn
Track and S&C renewals	c.£0.12bn	c.£0.05bn
Removing level crossings along HS2 route	c.£0.01bn	
Station renewals and accessibility improvements where HS2 will call	c.£0.03bn	

Source: Network Rail
* Note that numbers may not sum due to rounding.

3.16 These projects are still at an early stage of development and the costs in Table 3.1 will be subject to change. However, these costs have been determined in line with Network Rail's standard estimating processes (including risk allowance for optimism bias in early-stage estimates), so these can be considered as P50 costs.

3.17 For clarity, some of these renewals projects will also interact with enhancements projects (funded through the Rail Network Enhancements Pipeline (RNEP), or as part of the HS2 programme), which are still in development. However, Network Rail has confirmed that all of the work and costs discussed herein fall within the scope of OSMR activities (and thus would be funded by the SoFA). In particular, when we provided our initial advice in May 2022, Network Rail was still considering whether any of the £0.5bn could be funded from the HS2 programme, though it has now

concluded that, in its view, this is not possible. This is on the basis that these are renewals of life-expired, mainline assets.

3.18 As noted above, Network Rail outlined four scenarios for how this work could be spread across CP7, CP8, CP9 and CP10. The four scenarios are characterised as follows:

a. **Scenario 1**: £1.2bn of renewals in CP7 (i.e. all the items listed in Table 3.1), followed by commissioning of ETCS in CP8;

b. **Scenario 2**: £0.7bn of renewals in CP7, spreading the remaining £0.5bn across CP8 and CP9 and then commissioning ETCS in stages;

c. **Scenario 3**: £0.53m of renewals in CP7, with remaining renewals across CP8, CP9, CP10; and

d. **Scenario 4**: £0.475m of renewals in CP7, with remaining renewals across CP8, CP9, CP10.

3.19 The four scenarios are summarised in Table 3.2, where the colours reflect Network Rail's own assessment of the cost or risk (green is low, red is high).

3.20 We further challenged Network Rail to provide an indication of the value (£m) for the largest items, rather than just a qualitative rating (green to red). This was not possible for every item, but we asked Network Rail to prioritise the 'red' risk items. The text and numbers shown in Table 3.2 represent the best information available at this time, which we were able to validate with evidence.

Table 3.2 Summary of scenarios provided by Network Rail*

	Scenario 1			Scenario 2			Scenario 3			Scenario 4		
Cost/Risk	**CP7**	**CP8**	**CP9**	**CP7**	**CP8**	**CP9**	**CP7**	**CP8**	**CP9**	**CP7**	**CP8**	**CP9**
Renewals	£1.2bn			£0.7bn	>£0.5bn		£0.53bn	>£0.7bn		£0.48bn	>£0.7bn	
Renew scope: Crewe	Renew + ETCS	-	-	Renew + ETCS	-	-	Renew + ETCS	-	-	Renew + ETCS	-	-
Warrington	Renew	ETCS	-	Renew	ETCS	-	-	Renew	ETCS	-	Renew	ETCS
Preston	Renew	ETCS	-	-	Renew	ETCS	Refurb >		Renew	Refurb >		Renew
Carlisle	Renew	ETCS	-	Refurb >		Renew	Refurb >			Refurb >		
Asset failures					>£0.1bn		>£0.1bn			>£0.1bn		
Delays (incl. HS2)	n/a			n/a	>£0.5bn**		n/a	>£0.5bn**		n/a	>£0.5bn**	
Abortive costs												
Cab fitment	<£10m						n/a			n/a		

Source: Network Rail

* Red = high cost or risk, Green = low

** This is very approximate but is based on detailed analysis of disruption avoided on a comparable programme (the East Coast Digital Programme (ECDP)), factored for differences in traffic volume, asset condition and introduction of HS2 on WCML North.

Our review of Network Rail's four scenarios

Scenario 3 and 4

3.21 Scenarios 3 and 4 would delay renewals for so long that the ability to maintain assets could be compromised, introducing a higher risk of failures as well as an increased need for short-term refurbishments to keep the assets functioning.

3.22 Short-term refurbishments are inefficient because they introduce an extra round of design and access costs. However, more significantly, much of the cost would be abortive. This is because it relates to work on conventional signalling systems that would soon (within one or two control periods) need to be replaced with digital-compatible systems to enable the roll out of ETCS. For example, this could involve major repairs to a signal gantry that would no longer be needed with the introduction of ETCS. Given the inefficiency of the abortive costs, combined with the increased risk to safety and performance, these scenarios cannot reasonably be considered as best practice or efficient asset management, so we would advise against Scenarios 3 or 4.

Scenario 1

3.23 Scenario 1 (delivering £0.7bn + £0.5bn of renewals in CP7) does not involve any abortive costs or significant inefficiencies. While Network Rail has indicated that the assets relating to the £0.5bn of renewals could be maintained until the end of CP7, many of these assets are life-expired and have already had renewals deferred from previous control periods. On this basis, renewing these assets in CP7 is a reasonable approach to minimise the risk of asset failures and minimise long-term customer impact. As such, we consider Scenario 1 is efficient and in line with best practice.

3.24 However, there are some key risks to the successful delivery of Scenario 1:

a. **Network Rail has not completed its detailed plans for delivering the additional £0.5bn of renewals in CP7**. In terms of access, delivering the works at Warrington, Preston and Carlisle should be similar in CP7 to delivering the same works in CP8 and CP9 and may in fact be simpler in CP7 before the introduction of HS2 services. However, the additional volume of renewals in CP7 introduces a risk that Network Rail and its supply chain may not have sufficient resources to design and deliver the work. Network Rail noted that it is making changes to its procurement strategy going into CP7, which gives it access to a wider range of suppliers. We agree that this helps to mitigate the risk, but it does

not remove it. The OBC will need to provide assurance on deliverability of the full renewals programme in CP7. Based on our monitoring of Network Rail's delivery in CP6, we consider it is likely that some of the £1.2bn will be under-delivered and will slip into CP8. This could provide a justification for commencing the full programme of renewals, but with a level of funding below £1.2bn, to account for forecast under-delivery.

b. **Delivering the full list of renewals in CP7 allows the introduction of ETCS in CP8 on that part of the network**. However, benefits from this can only be realised if Network Rail and TOCs make sufficient progress with their cab fitment programme in CP7. Network Rail has identified this as a risk and some TOCs have raised concerns with us about the timelines for cab fitment. Network Rail identified that the additional cost to that already put forward for delivering the required cab fitment for WCML North in CP7 is relatively small (less than £10m), but we consider that the risk of slippage in the cab fitment programme is high and outside the direct control of the team managing the WCML North programme, hence the red rating in Table 2. (It is important to note that funding fewer renewals in CP7 (i.e. selecting Scenarios 2, 3 or 4) would not remove this risk to the cab fitment programme – it would simply reduce the impact of cab fitment delays on WCML North).

c. **The only other 'red' item for Scenario 1 is the high cost of funding all the renewals in CP7**. We recognise the fiscal challenges faced by the UK Government and that the £0.5bn difference between Scenario 1 and Scenario 2 may not be affordable. Ultimately, this is a decision for the UK Government (taking account of other priorities and what they would be likely to deliver), but our advice is that it should consider carefully the costs and risks associated with not funding this £0.5bn in CP7. This is discussed below.

Scenario 2

3.25 Scenario 2 defers renewals (including life-expired assets) into CP8 and CP9. This would be managed with increased maintenance and some refurbishments. This does not represent the lowest whole-life-cost approach and introduces inefficiencies and some abortive costs.

3.26 Scenario 2 is likely to result in an increase in asset failures. This increases the risk to safety and performance and would also result in additional costs for reactive repairs and additional access. We challenged Network Rail to estimate these additional costs and it concluded that these costs may be in excess of £0.1bn in CP8, based on current trends in asset failures and the cost of reactive works.

3.27 In terms of asset management, Scenario 2 is not optimal, with inefficiencies and risks likely to be realised in CP8 and beyond. However, if Scenario 1 is not affordable in CP7, then Network Rail could deliver Scenario 2 and apply reasonable mitigations to limit asset failures within CP7. However, proceeding with this scenario would require significant additional funding in CP8 and subsequent control periods (well in excess of the £0.5bn saved in CP7) for Network Rail to achieve efficient, best-practice asset management in subsequent control periods.

3.28 The major risk in Scenario 2 is the impact on HS2 services shortly after their planned introduction in CP8. This impact includes:

a. possessions work to carry out planned renewal works that would cause disruption to HS2 services (and to existing WCML services);

b. later introduction of ETCS on some parts of the line, preventing optimisation of HS2 performance and creating less resilience; and

c. failure of life-expired assets, causing unplanned disruption to HS2 trains.

3.29 There is currently insufficient evidence to quantify these risks accurately. However, we challenged Network Rail to provide an indication of the order of magnitude, which we then validated against other sources of information. This included:

a. Network Rail's detailed analysis from the ECDP. This analysis indicated the value of delays and disruption avoidable through asset renewals and the introduction of ETCS, factored for the size and traffic levels on the WCML North programme, may be well in excess of £1bn in the long term. The impact in CP8 and CP9 (while the renewals are being completed) would be in the order of £0.5bn.

b. Published costs associated with delays on the HS1 network (the only other UK high-speed network available as a comparator) indicate that the average cost per minute of delay on HS1 is several orders of magnitude higher than for Network Rail's current mainline services. This suggests that the preliminary estimate (£0.5bn cost of delays and disruption) should be treated as an optimistic lower bound. On this basis, it is reasonable to assume that the £0.5bn saving on renewals in CP7 is likely to result in total costs in excess of £1.1bn in CP8 and CP9 (>£0.5bn to complete the renewals; >£0.5bn in HS2 & WCML disruption; and >£0.1bn reacting to asset failures).

c. It is important to note that the cost of disruption to HS2 will depend on the performance regime and pricing for HS2 services on WCML North, including factors such as investment recovery charges and premium ticketing. These are

decisions for the UK Government. As noted above, Network Rail's information on likely disruption costs (which were in the order of £0.5bn) was based on conventional mainline services and we are suggesting this is a lower bound for disruption costs for any HS2 services. The cost rates for disruption could be higher (by an order of magnitude) if performance regimes and pricing for HS2 were similar to HS1.

3.30 Furthermore, this simple assessment does not take into account the reputational costs of delays or passenger inconvenience on newly introduced HS2 services, which could lead to a decline in ticket sales and undermine the overall business case for HS2.

3.31 As noted above, we recognise there is still some wider uncertainty over the HS2 programme, including the scale and pace of the project. In the event that plans to introduce HS2 services on WCML North change, this would change the risk profile for these renewals. This would need to be addressed through the regular governance of the WCML North programme.

Chapter 4: Impact on maintenance costs at 'reduced cost' spending levels

Background

4.1 In its March 2022 initial CP7 submission, Network Rail included assumptions surrounding an expected increase in maintenance costs in CP7 of 3-5% if renewals funding was set below a 'steady state' funding level. In our May 2022 advice, we requested additional information from Network Rail to evidence this potential uplift in maintenance spend.

4.2 Since then, we have met with Network Rail to understand its assumptions and discussed the availability of data to support the proposed 3-5% uplift in maintenance spend. Network Rail advised that, because of the number of variables impacting on train performance, faults and maintenance activity, it would be difficult with the data available to robustly model a link between renewals deferral and increased maintenance. Also, it argued that a degree of 'engineering judgement' and extrapolation was required given the limited data available at this stage of the planning process and the existing quality issues with Network Rail's reporting of maintenance volumes (discussed below). Furthermore, there is still considerable uncertainty over how Network Rail will prioritise its renewals portfolio and any subsequent impacts that might then occur. Reflecting the above issues, Network Rail delivered a qualitative assessment of the drivers contributing to the uplift and a set of supporting case studies.

4.3 Recognising the complexity and limitations described by Network Rail, we agreed to this approach to enable delivery of this part of the supplementary advice.

4.4 All numbers in this chapter are in 2023-24 prices using the November 2021 BoE CPI forecasts for inflation.

High-level summary of our findings

4.5 Based on the information Network Rail provided to us in August (and noting the limitations of its analysis, as discussed above), we agree with Network Rail's conclusions that there is likely to be an additional maintenance requirement under the 'reduced cost' funding scenario. However, we consider that the impact is likely to

be felt most in later control periods and consider it likely that only a minimal increase for maintenance costs will be required in CP7, as it is possible to cover a significant proportion of the impacts within current plans. We are concerned that Network Rail's additional analysis (submitted to us in August) may have unduly focussed on the areas that will increase maintenance costs and has not provided sufficient balance by exploring factors that may mitigate the impacts. These reflect, for example, that:

a. The extent of assets identified for deferral, when measured against the whole breadth of network wide infrastructure, is relatively small. Furthermore, and given an expected lag in faults materialising, the impact of reduced expenditure would only have a noticeable impact towards the end of CP7. It should be noted that if assets are not renewed, the effect of the lag reduces at a programme level and the impact (i.e. a need for more maintenance) would continue to increase through CP8 and CP9.

b. There is some existing flexibility within the maintenance operation at a working level, which suggests that Network Rail could absorb nominal increases in activity on maintenance activities within CP7. We recognise, however, that this is less likely if expenditure is significantly low or continues to remain below lowest whole-life cost in CP8 and CP9 as the volume of faults would increase.

c. Network Rail has not taken due account of the anticipated improvements from adopting technologies and new working practices in CP7, all of which should mitigate the requirements on maintenance activities (and/or spend).

d. The implications of already delivered or planned works (e.g. enhancements and Lord Mair and Dame Slingo-related initiatives) on improving network resilience and hence reducing the need for maintenance activities have already been separately identified (and reflected in the proposed funding requirements).

4.6 The primary impact of deferred renewals is that maintenance costs will increase in subsequent control periods, potentially up to the £0.5bn level detailed by Network Rail. Additional maintenance costs will continue to increase if lower expenditure (when compared with lowest whole-life cost) continues.

4.7 Furthermore, as per our May 2022 advice, and if funding is set at a 'reduced cost' funding level, we would expect significant levels of additional funding would be required to recover asset condition in CP8 and CP9 through renewals activity. Current estimates indicate that, when combined with the programmed CP8 activities, renewals funding in CP8 would need to increase by £5bn above the 'reduced cost' funding level and be maintained at that level in CP9. However, this estimate excludes

the additional maintenance costs and, when the two are combined, they could represent an affordability challenge for the UK Government.

4.8 Furthermore, we understand that options are also being explored for funding below the 'reduced cost' funding level. This would require Network Rail to defer even more renewals within CP7, which is likely to lead to more asset failure and additional maintenance costs in CP7. In this scenario, and in later control periods, it is likely that expenditure on maintenance activities would need to increase significantly, potentially above the £0.3bn-£0.5bn range quoted by Network Rail, until renewal activity deferred from CP7 has been conducted.

Our review of Network Rail's updated maintenance analysis

4.9 We have reviewed the additional evidence supplied by Network Rail and have the following observations:

a. Data quality – We recognise the issues Network Rail had in obtaining data to conduct this analysis. This is a known issue as it was investigated through an Independent Reporter study into maintenance volume reporting, conducted in March 2022. This review identified discrepancies in how maintenance volumes are currently captured across Network Rail. These differences at Route Maintenance Delivery Unit (MDU) level in the sample make it difficult to identify overall trends that can be 'aggregated' up to a regional level. This may impact on the accuracy of any analysis undertaken by Network Rail. A conclusion of the review highlighted that there is further scope to improve the recording of reactive work (as opposed to planned volumes) so it provides greater clarity between preventative maintenance and reactive fault fixing. This would help to provide a greater understanding of the asset performance and support future planning against various funding scenarios. We are monitoring Network Rail's progress as it actions the recommendations provided by the Independent Reporter to improve the accuracy of maintenance volume reporting.

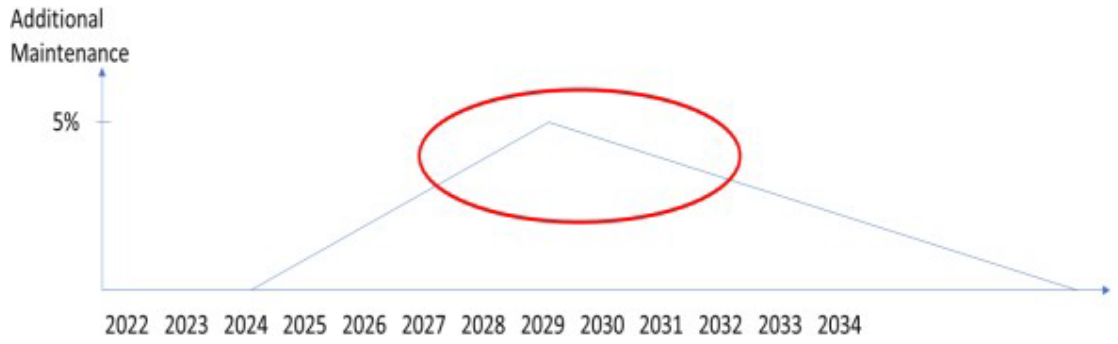
b. Renewals Expenditure – As part of addressing the issues identified in the data quality section, Network Rail indicated in its March 2022 initial CP7 submission that there is an additional funding requirement of £120m across the network. This consists of £65m for strengthening data quality reporting and £55m for track access plus timetabling of additional data runs. Although we recognise the merits of these on-going projects, we have concerns, as we would expect to be seeing benefits from CP6 expenditure included in Network Rail's CP7 plan. We propose to review these elements as part of our review of the SBP.

c. Qualitative v Quantitative – Noting the issues with Network Rail's data and methodology (as discussed above), unconscious biases (both optimistic and pessimistic) can be introduced by engineering judgement. Without data to inform opinions, there is the possibility that undue credence could be given to erroneous viewpoints.

d. Evidence – The 3-5% figure Network Rail has provided is predominantly based on qualitative judgement. Its analysis has, therefore, not been able to provide the granularity required to support the range quoted. Maintenance costs are a function of labour, material and plant. However, Network Rail's submission does not explore these in sufficient detail. Furthermore, the regional variability of the condition of asset portfolios, localised issues and variability in asset maintenance requirements have not been considered. However, our primary concern is that Network Rail has focused exclusively on the areas which might increase maintenance and has not provided sufficient balance by exploring factors which may mitigate the impacts. Specific examples are discussed below.

e. Timing – Network Rail's analysis demonstrates a number of drivers for increases in cost if renewals are deferred. However, the timing of these impacts is not always clearly articulated. As an example, it is recognised that assets that are reaching the end of their service life are more prone to failure. However, there is uncertainty about when failure occurs, as well as the nature of the failure and its subsequent impact. As part of its additional evidence linked to our supplementary advice on train service performance, Network Rail developed analysis (see Figure 4.1 below) showing how it considers maintenance costs will increase over time and recover assuming its mitigations (such as technology / tool advances) take effect.

Figure 4.1 Network Rail expected additional maintenance spend by year



Source: Network Rail

Our view is that this analysis of additional maintenance costs rising to 5% is overly pessimistic, and there will be a gap between the planned end of asset service life and asset failure. This 'lag' effect means that we are unlikely to see the number of asset failures increase significantly in the early years of CP7. Nevertheless, and in line with Network Rail's view, we would expect a steady increase in failures over time which would likely be significant in later control periods if renewals expenditure levels are not restored. It should be noted that this advice is limited to the 'reduced cost' funding scenario as set out in Network Rail's initial CP7 submission. If funding levels were reduced further (and with additional renewals deferred), there would be an increased volume of assets nearing the end of their service life and, therefore, a heightened probability of failures at a system level. In this scenario, increased maintenance costs would likely be above the estimates provided for the 'reduced cost' option.

f. System change – Network Rail is embarking on schemes to introduce new technologies and new working practices which will influence maintenance costs, such as Intelligent Infrastructure, research & development (R&D), efficiency initiatives and 'Modernising Maintenance'. The impact of these schemes has not been fully considered within Network Rail's evidence. Furthermore, examples such as the impact of improvements in drainage maintenance (which will have an unquantified improvement on the sustainability of other asset groups) and the short / long-term impact of potential future changes in asset usage (i.e. due to reduced passenger operations but increased freight operations) are also excluded from Network Rail's analysis.

g. Resourcing – Network Rail has not been specific on how/when in its costing process that it intends to apply the 3-5% uplift; our expectation, based on current evidence, is that the uplift is a pre-efficient cost that applies specifically to preventative and reactive maintenance activity. The additional cost would therefore arise from additional resources to conduct these maintenance tasks. [Redacted].

   Network Rail currently manages deferred renewals successfully between years and control periods via increased maintenance activities and minor works, including meeting peaks in demand at a marginal level. Our understanding is that the ratio of time-on-tools versus non-time-on-tools in Network Rail MDUs is low, indicating an opportunity for improvement in resource capacity. With changes to working practices, for example improved planning (and noting the change to risk-

based maintenance as an enabler for this), there is a possibility that most MDUs will be minimally impacted by reduced renewals spend in CP7.

4.10 Network Rail has reappraised its view on maintenance costs in CP7 and is now indicating that costs would grow through the period to an exit position of a 3%-5% increase in costs. Network Rail has indicated that this would average out as approximately 2% additional costs on maintenance in CP7. Although this revised figure makes some allowance for 'lag', our view is that other mitigating factors remain and any increases in costs would be marginal.

Next steps

4.11 In addition to progressing the recommendations associated with the March 2022 Independent Reporter study, we expect Network Rail to begin the process to instigate improvements in estimating long-term impacts on maintenance costs as part of bottom-up planning for its SBP.

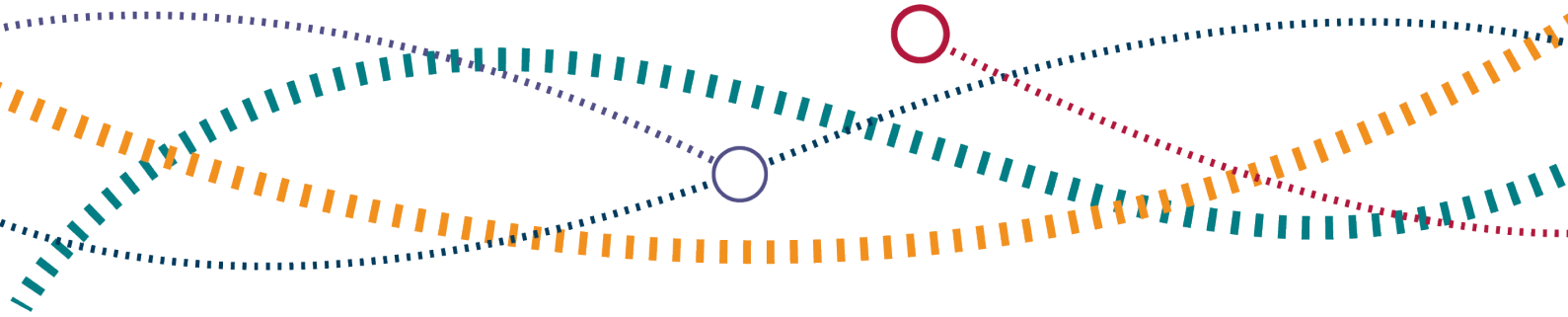
4.12 We recognise the current maturity of Network Rail's maintenance modelling but expect Network Rail to work towards the development of an evidence-based approach to maintenance planning. We also expect to see evidence of best practice being regularly identified and shared within the organisation and that an appropriate governance process is instigated. We recognise that it is unlikely that this is fully achievable before CP7 and will likely be a work-in-progress for much of CP7.

Any enquiries regarding this document should be sent to us at orr.gov.uk

Supporting document B: Second supplementary advice on Network Rail's digital signalling plans

Periodic Review 2023 (PR23)

16 September 2022



Contents

1. Executive summary

Background

1.1 Network Rail's initial CP7 submission included proposed spend in its plans which support the deployment of digital signalling in England & Wales in CP7. In Scotland, the funding requested for digital signalling aims to support potential future digital solutions in keeping with Scotland's signalling strategy. Network Rail's funding request includes:

(a) four digital signalling renewals in England & Wales (£690m), held in regional plans;

(b) fleet fitment (£1.2bn), held in Eastern and Route Services plans;

(c) research and development (R&D) programmes (£178m), held in Technical Authority 'other renewals' plans and separate from the wider R&D plans; and

(d) enabling costs (£110m), held in Eastern and Technical Authority plans.

1.2 We provided our initial advice to the UK and Scottish governments in May and June 2022 on the development of their High-Level Output Specifications (HLOS') and Statement of Funds Available (SoFAs). This included our views on Network Rail's digital signalling plans for CP7 including Operations, Support, Maintenance and Renewals (OSMR) costs as well enabling costs such as fleet fitment and R&D programmes.

1.3 We concluded that Network Rail needed to submit more information in four key areas so that we could provide additional advice on Network Rail's digital signalling plans. The four areas we agreed to provide supplementary advice on for digital signalling are set out below:

(a) Network Rail's Network Rail's estimated digital signalling renewal project costs and Signalling Equivalent Unit (SEU) rates;

(b) Network Rail's plans for fleet fitment and the funding requested in CP7;

(c) Review of an option included by Network Rail in its initial CP7 submission to reduce passenger fleet fitment funding by c.£200m; and

(d) Understanding Network Rail's R&D programme for Optimised Train Track Operation (OTTO).

1.4 Since then, Network Rail provided us with updated project cost forecasts and additional information on SEU rates, fleet fitment and OTTO. Some of this information has changed since Network Rail's initial CP7 submission.

1.5 The following report sets out our supplementary advice on digital signalling to the Department for Transport (DfT) and Transport Scotland. It is based on our scrutiny of Network Rail's initial CP7 submission which was provided to ORR on 31 March 2022 and additional information provided by Network Rail between June and August 2022 in response to queries we raised.

1.6 We are providing the same advice to the UK and Scottish governments, reflecting our view that this report includes information relevant to both funders. We recognise that funders in Scotland are taking a different approach to the deployment of digital signalling, however our advice covers the GB network as a whole.

Scotland specific advice

Funders in Scotland may find chapters 1, 2, 4 and 6 the most useful. These chapters focus on our conclusions and recommendations, setting the context for Network Rail's digital signalling plans in CP7, our views on fleet fitment funding and OTTO which we mentioned in our initial advice to Scottish Ministers in May 2022

Although information in chapters 3 and 5 is most relevant to funders in England & Wales we are also providing it to Scottish funders. These chapters focus on project costs for the three digital signalling renewals proposed in England & Wales and an option included by Network Rail to reduce passenger fleet fitment funding.

1.7 All figures in this report are GB wide and shown in 2023-24 prices unless otherwise stated. Cost forecasts provided by Network Rail included some costs inflated using the November 2021 forecast and some costs are inflated using the May 2022 forecasts.

Conclusions and recommendations

Advice to funders

1.8 We have summarised the key findings from our supplementary advice to Ministers in Table 1.1 below. This provides a high-level overview of our advice in the four areas we committed providing further thinking on.

Table 1.1 Summary of advice to funders

Advice ID	Area	Summary of advice
A1	Renewals costs	There has been an average c.35% increase to digital signalling renewals cost forecasts between Network Rail's initial CP7 submission and this supplementary advice. The forecasts will continue to evolve given the early stage of development of its plan. As such we do not have full confidence in the cost forecasts provided by Network Rail in its initial CP7 submission. We also expect the cost profile to change and some costs to move into CP8.
A2	SEU rates (used to forecast and measure unit costs for signalling projects	East Coast Digital Programme (ECDP) has a lower SEU rate than the three other digital signalling renewals projects in England & Wales as it has been developed further, in collaboration with a confirmed supplier. We expect Network Rail to provide its own assurance and challenge on project costs in its SBP submission which take account of evidence from ECDP. The three other projects have used the same approach as each other to develop the SEU rate and we consider this method is appropriate at this stage of development.
A3	Passenger fleet fitment	We consider the funding requested for passenger fleets is commensurate with the extent of renewals planned to commence in CP7 and CP8 digital signalling workbanks. We consider passenger fleet fitment could be funded via the PR23 process to ensure the delivery of this critical enabler for digital signalling.
A4	Freight fleet fitment	We consider it appropriate to include funding for freight vehicles in the PR23 process. This will safeguard existing commitments already made by funders in England & Wales for ECDP and support the future roll-out of digital signalling renewals.
A5	On Track Machine (OTM) fleet fitment	The strategy for OTM fitment is not as well developed as the freight and passenger fitment programmes. That said, it is important that funding is provided for the fitment of OTM vehicles alongside other fitment programmes in the PR23 process.
A6	Heritage & Charter	We consider funding for H&C fitment could be included within the PR23 process. However, this should be dependent on conclusions from the First in Class (FiC) (i.e., when a vehicle is the first of its

Advice ID	Area	Summary of advice
	(H&C) fleet fitment	class to be fitted with ETCS) feasibility fitment programme being carried out by ECDP.
A7	Quantitative impacts of the reduced cost option	We cannot say with any degree of certainty that the additional costs estimated by Network Rail are accurate as these have not been modelled in detail. That said, we accept the justification Network Rail has provided in developing these illustrations and conclude that additional costs much greater than the suggested £200m reduction could be incurred by industry if fleet fitment funding is reduced in CP7.
A8	Qualitative impacts of the reduced cost option	If passenger fleet fitment funding is reduced such that volumes fall below the volumes required to successfully deliver the renewals identified in CP7, it will impact the digital signalling renewals which can be delivered in CP8 and beyond.
A9	OTTO	Network Rail's initial CP7 submission included expenditure for the research and development of OTTO but no expenditure for projects which propose to use OTTO components. It is essential that the transition to full ETCS continues to progress. However, we consider OTTO may help to manage some of the affordability and deliverability challenges faced by Network Rail in future control periods by delivering partial solutions faster on the way to full ETCS in future.

Risks to delivery

1.9 We consider there are significant risks to the deliverability of Network Rail's plan. These risks are not the sole responsibility of Network Rail, but it will play a pivotal role in the management of these risks and the co-ordination of industry. Table 1.2 below summarises our view of these key risks.

Table 1.2 Key risks in the deliverability of Network Rail's plans

Risk ID	Area	Risk
R1	Direction and strategy	The Long Term Deployment Plan (LTDP) does not reflect the current deployment strategy for the roll-out of digital signalling. We consider the LTDP should be updated to reflect the current strategy across all Network Rail regions, including infrastructure renewals and fleet fitment plans to support the delivery of digital signalling.
R2	Capability and capacity to deliver the volume of signalling renewals	There is a current backlog of signalling renewals caused by a combination of a gradual build-up of delayed renewals and the cyclical nature of past infrastructure investments. A key challenge for the deployment of digital

Risk ID	Area	Risk
	(conventional and digital) in CP7	signalling is the capacity of industry to meet the increase in demand caused by approaching end-of-life renewals.
R3	Development of project costs and uncertainty in plans	There remains uncertainty in Network Rail's which will continue to be refined between now and submission of its SBP, with more accurate assumptions and detailed estimates being provided. Uncertainties such as allowances for optimism bias will need to be transparent in the build-up of Network Rail's plans.
R4	Management of fleet fitment programme	The management of the fleet fitment programme is a critical piece of work that will require co-ordination across industry. We are aware of concerns from the supply chain regarding the need for a visible pipeline of work as well as from operating companies (refers to all types of operators e.g., freight, passenger etc.) who will need to remove units from service to enable retro fitment of fleets. The level of investment in the overall deployment of digital signalling should be determined by the slower of fleet fitment or the digital signalling renewals for optimum outputs vs. spend.
R5	Optimism bias in Network Rail's plans (cost and time)	Network Rail has included a cost allowance for optimism bias in its plans which is consistent with standard allowances used for projects at this phase of their delivery. We consider there may also be some optimism bias included in its delivery programme for fleet fitment and the deployment of digital signalling renewals. This view is based on the existing delays to First in Class (FiC) fleet fitment and Network Rail's capability to deliver conventional signalling renewals in CP6.

2. Setting the context for Network Rail's deployment of digital signalling in CP7 and Beyond

Introduction

2.1 In previous control periods and during CP6, Network Rail has provided information that suggests the level of signalling renewals required to maintain the existing signalling network effectively could be undeliverable in terms of affordability (cost) and deliverability (volume). This is referred to by Network Rail as the signalling renewals bow-wave.

2.2 Evidence presented previously indicates that a change of technology from conventional signalling (line-side signals) to European Train Control System (ETCS, which refers to the wider signalling and control system for digital signalling), could alleviate the bow-wave because unit costs are anticipated to be lower, and resources can be managed more effectively by the supply chain. Other benefits, including safety and performance, are harder to quantify but should become clearly defined as deployment progresses and industry knowledge and experience is gained.

Signalling in England & Wales

2.3 In 2019, Network Rail, in response to a request from the Secretary of State for Transport, developed the Long Term Deployment Plan (LTDP) which sets out the strategy for the deployment of digital signalling across the rail network in England and Wales (Digital Railway long-term deployment plan - Network Rail). The latest version of the LTDP does not accurately reflect the current strategy of digital signalling due to delays in the deployment. We have recommended to Network Rail that the LTDP should be updated to reflect the current deployment strategy across all Network Rail regions, including infrastructure renewals and fleet fitment plans.

2.4 In England & Wales, the Department for Transport (DfT) has already committed to the replacement of conventional signalling with ETCS on a 100 mile section of the East Coast Main Line (ECML), which is part of the East Coast Digital Programme (ECDP). The Final Business Case (FBC) for ECDP was approved by the UK Government in June 2022, committing more than £1bn of funding towards this programme (£1 billion technology investment to bring railway into 21st century -

GOV.UK (www.gov.uk)). Further renewals funding is required from the PR23 determination to complete this pathfinder programme, this was included by Network Rail in its initial CP7 submission (£382m). Funders in England & Wales are sighted on this funding requirement as it was discussed in the ECDP FBC.

Signalling in Scotland

2.5 In Scotland, Transport Scotland is not supportive of digital signalling as currently presented in the LTDP. It has asked for more information from Network Rail on the benefits of digital signalling as it relates to the network in Scotland, compared with renewing the network conventionally or carrying out life extension works. Transport Scotland also wants to understand if there is an alternative to ETCS which is more appropriate given its networks characteristics, e.g., renewing according to line of route characteristics.

2.6 Network Rail Scotland is updating its signalling strategy, called Signalling Scotland's Future (SSF, formally referred to as the Whole System Signalling Strategy (WSSS)).

2.7 Network Rail Scotland has told us that the development of SSF will inform the updates to the LTDP. SSF requires approval by Transport Scotland and should set out the signalling strategy across Scotland including plans for digital signalling and fleet fitment.

2.8 We consider digital signalling would provide benefits to the network in Scotland, through improved performance, resilience, lower renewals costs, and avoiding reliance on a conventional signalling supply chain which is downsizing across Europe due to the move to ETCS.

2.9 There are also some aspects of digital signalling where the opportunities are even greater in Scotland than in England & Wales. In particular, forward plans for infrastructure in Scotland are more closely integrated with plans for new rolling stock and planned rolling stock changes are clearly connected to particular lines of route, which would make the phased introduction of ETCS far simpler in Scotland than in England & Wales. It should also be noted that some areas of Scotland's network may not be suitable for the deployment of digital signalling, for example the far north.

3. Network Rail's estimated digital signalling renewal project costs and Signalling Equivalent Unit (SEU) rate

Project costs

3.1 In Network Rail's initial CP7 submission, it provided forecasts for CP7 and CP8 expenditure for four digital signalling renewals projects in England & Wales. Since our initial advice in May and June 2022, we have also obtained Anticipated Final Cost (AFC) figures for these projects, across all relevant control periods. Forecasts are shown in Table 3.1 below. Network Rail has requested a total of £690m in funding across these four projects in CP7.

Table 3.1 Network Rail's digital signalling renewals forecast (2023-24 prices)

Project	Proposed CP7 spend (£m)	Proposed CP8 spend (£m)	Anticipated Final Cost (AFC) of renewal Total (£m)**
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

3.2 Network Rail's initial CP7 submission was developed on a top-down basis using standard national rates which were then applied to its regional digital signalling workbanks. We asked Network Rail for a detailed break-down of its project costs. Network Rail shared details on how costs were developed in its infrastructure cost model (RAIL BI) for application by regions. The cost model has been used to develop top-down forecasts. This is the same method used to develop forecasts

for conventional signalling and reflects the early stage of development that projects are in. Network Rail has a similar level of certainty in these costs as it would for conventional signalling projects at this stage of development. This is because the process used to develop digital signalling renewals project forecasts is similar to conventional renewals project forecasts at this early stage.

3.3 Network Rail also provided details on the SEU rates which are discussed further in paragraph 3.10 below. A break-down of the SEU rate was provided for each project. This included a base rate which contains components that are required for all signalling renewals schemes. There is also an inclusion for local allowances which contain components specific to each renewal and consider network characteristics. Network Rail also provided reasons for differences in rates across projects. (See Figure 3.1 for a break-down of the components of a digital SEU).

3.4 For projects at this stage of maturity we expect to see some variation in each iteration of cost forecasts. Network Rail has started to develop bottom-up forecasts since its initial CP7 submission. However, these forecasts were not available for our detailed review.

3.5 Network Rail did provide some information from its 'live' cost model. Our review of this information showed significant changes to the SEU rates and consequently the project AFCs from those submitted in Network Rail's initial CP7 submission. There is an average of c.35% increase in AFCs in the 'live' cost model being used by projects, we understand this would in-turn increase CP7 costs by c.35%.

3.6 Changes have occurred due to assumptions in the 'live' version of the cost model being updated between planning rounds. For example, the rate for inflation has been increased. An assumption regarding a decrease in SEU rates has also been removed. Network Rail told us this assumption was included in its initial CP7 submission in error and this cost reduction factor should have already been adjusted for. The reason an assumed decrease in SEU rates should have been removed from the cost model is partly due to delays in the deployment of digital signalling which means the SEU rate will not decrease as quickly as previously thought.

3.7 The magnitude of these AFC increases is greater than we would expect to see for conventional signalling projects at this stage of development. The underlying cost increase is due to a higher SEU now being used in the 'live' cost model. This points to an issue with Network Rail's cost forecasts in its initial CP7 submission. Network Rail will need to ensure its bottom-up planning is as rigorous as possible to minimise continued cost uncertainty on these projects. Planning should consider

the learning from the ECDP and verify the assumptions used to develop its plan, to avoid any further sudden cost changes in future

3.8 We also expect the cost profile to change, that is, how much money is spent across years 1-5 of CP7 and CP8. We recognise that these costs will continue to be refined between now and the submission of Network Rail's Strategic Business Plan (SBP), which is expected in February 2023.

3.9 ***Advice: Whilst Network Rail's assurance of its cost forecasts is commensurate with the projects' stage of development to date, the costs are not fully assured. There has been an average c.35% increase to digital signalling renewals cost forecasts between Network Rail's initial CP7 submission and this supplementary advice. We do not have full confidence in the CP7 forecasts provided by Network Rail in its initial CP7 submission, given the early stage of development of its plans. We also expect the cost profile to change and some costs to move into CP8.***

Signalling Equivalent Unit (SEU) rates

3.10 Network Rail submitted information on how it calculates SEU rates. These are the rates used to measure and forecast the unit costs of a project and forms part of its overall project costs. It provided SEU rates for different work types used by projects, and a break-down of the SEU rate for each project. It provided reasons for differences in rates across projects, for example, local allowances made by regions.

3.11 There are two main SEU work types associated with digital signalling, these are explained below:

a. Work Type 20 (WT20 - Re-signalling ETCS level 2, without signals) – this is a full renewal in digital form and is the primary SEU work type associated with digital signalling.

b. Work Type 29 (WT29 – Re-signalling ETCS level 2 with lineside overlay signals) – this work type used in areas for driver training, in these areas an overlay will be constructed so both conventional and digital signalling will run at the same time.

3.12 In our initial advice we commented on the large variance between the SEU rate for ECDP and the three other digital signalling renewals projects Network Rail is proposing to commence in CP7.

3.13 The SEU rates have been developed by using historical data from conventional signalling renewals projects as well as including local allowances [redacted] which may be required for digital signalling renewals. The local allowances include site specific line items such as junction lighting, additional cable security etc. The application of local allowances using local knowledge and expertise causes variations between the SEU rates for each project.

3.14 [Redacted]

Figure 3.1 [Redacted]

3.15 We expect the SEU rates to change between now and Network Rail's SBP submission as it continues to refine its forecasts and gain a better understanding of each project's requirements. There are key factors for Network Rail to consider in the development of its bottom-up calculation of the SEU rate, these include:

a. the type of digital signalling being installed e.g., WT20 or WT29;

b. the level of local allowances used by projects;

c. understanding and implementing the access requirements for each project; and

d. the projected timescales to agree the engineering requirements for each project.

3.16 [Redacted]

Table 3.2 Network Rail's forecast WT20 SEU rate for digital signalling renewals included in its initial CP7 submission (2023-24 prices)

Project	SEU rate (£m) (WT20)	Number of SEUs	Total WT20 cost (£m)
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Source: costing information provided by Network Rail

* Note, the costs for ECDP include CP6 spend, and additional work types identified by the programme as it has carried out more rigorous planning (see Table 3.1)

3.17 ECDP has a lower SEU rate than other projects due to the bottom-up planning that has already been carried out. We therefore have more confidence in this estimate than the forecasts for the three other projects which have only carried out top-down planning and include a level of uncertainty greater than ECDP. Based on the SEU rate for ECDP it is possible that the other projects' rates may decrease once teams are working directly with suppliers to refine their inputs to the modelling and

provide detailed estimates. Network Rail has not relied on supplier estimates which have been provided for ECDP when developing forecasts for the other projects.

3.18 R&D as part of the Target 190 plus (T190) programme aims to reduce Network Rail's SEU rates down to £190,000 (i.e., spending £190k, on average, per renewal). Network Rail has said this is only likely to be achievable once it has engaged in significant 'learning by doing' during early digital signalling renewals, probably during CP8. Following discussions with Network Rail we understand that the expected reduction will not be achieved in the timelines previously anticipated and therefore these reductions are not included in the SEU rates used for projects planned to commence in CP7. Network Rail assume a reduction in SEU rates will not happen until CP8. It should be noted this is dependent on the commencement of fleet fitment and digital signalling renewals in CP7.

3.19 We haven't seen sufficient evidence that project costs have been challenged by Network Rail based on the learning from ECDP. We expect Network Rail to provide its own assurance on project costs in its SBP submission which take account of evidence from ECDP.

3.20 Table 3.3 below sets out the WT29 SEU rate for projects that are using digital signalling overlays for driver training purposes and the number of SEUs expected.

Table 3.3 Network Rail's forecast WT29 SEU rate for digital signalling renewals planned to commence in CP7

Project	Re-signalling with overlays SEU rate (WT29) (£m)	Number of SEUs	Total WT29 cost (£m)
ECDP*	[redacted]	[redacted]	[redacted]
Warrington - Wigan	[redacted]	[redacted]	[redacted]

Source: information provided by Network Rail for supplementary advice

* Note, the costs for ECDP include CP6 spend, and additional work types identified by the programme as it has carried out more rigorous planning (see Table 3.1)

3.21 [Redacted] Different approaches and underpinning assumptions regarding driver training and mileage accumulation are being used by different regions, particularly for the schemes anticipated to be completed earliest.

3.22 [Redacted]

3.23 ***Advice: ECDP has a lower SEU rate than the three other digital signalling renewals projects as it has been developed further, in collaboration with a confirmed supplier. The three other projects have used the same approach as each other to develop the SEU rate and we consider this method is appropriate at this stage of development. We expect these rates to change between now and Network Rail's submission of its SBP – and based on rates used by ECDP we expect the rates to reduce. We expect Network Rail to provide its own challenge and assurance on project costs in its SBP submission, which should take account of evidence from ECDP. Whilst overlays (Work Type 29) are necessary for driver training they significantly increase the cost of the renewal. Network Rail should review the number of overlays being proposed to ensure this is an efficient use of funding.***

4. Network Rail's plans for fleet fitment and the expenditure included in its initial CP7 submission

4.1 In our initial advice we said there was a strong reason to include all the costs of digital signalling within the scope of the PR23 process, i.e., to also include the non-infrastructure costs that have previously been included in operators' plans. The majority of Network Rail's digital signalling costs in CP7 are not infrastructure costs but those related to fleet fitment (c.£1.2bn). Some of these costs will also be incurred in CP8. This was due to Network Rail wanting to include all the expenditure in the same place and the intrinsic link between digital signalling activities. Following further analysis and review of the information provided by Network Rail we still consider this to be the case. That said, there remains a degree of uncertainty with both supply chain readiness to deliver the required level of fitment and operating companies' capacity to release vehicles for retro fitment in line with the fleet fitment programme.

4.2 We anticipate funding for fleet fitment may be confirmed at the same time as, or as part of, the SoFA decisions. In our initial advice we highlighted that clarity and certainty of fleet fitment funding was crucial to the deployment of digital signalling as it is a critical enabler for the deployment of ETCS.

4.3 The funding requested by Network Rail for fleet fitment is currently included in the Eastern region and Route Services plans. Funders will need to decide whether fleet fitment should be included in Network Rail's plans for CP7. This advice gives our views on Network Rail's estimate of fleet fitment expenditure and whether it should be included in Network Rail's plans.

4.4 It is essential that the programme of fleet fitment is aligned to the digital signalling renewals plan as there is a long lead-time for ETCS fleet fitment. It therefore needs to be delivered in advance of the infrastructure renewal to ensure trains can run on the network.

4.5 Network Rail has told us that the fleet fitment expenditure of £1.2bn is needed to link to the forecast digital signalling renewals volumes in CP7 and CP8 and that sufficient progress is required in CP7 to realise the full benefits of the £1.2bn expenditure. Consideration needs to be given to the operational reasons for

having such an extensive fleet fitment programme in CP7 and the deliverability risks this presents. Especially given the fleet fitment programme has existing deliverability issues in CP6.

4.6 Network Rail inclusion of £1.2bn for fleet fitment in its initial CP7 submission included fitment for multiple categories and classes of fleet, including for passenger, freight, On Track Machines (OTMs) and Heritage and Charter (H&C) trains. This split is shown in Table 4.1 below. Note, not all units cost the same amount to fit, for example FiC fleet fitment is assumed to be more expensive than subsequent fleet fitment.

Table 4.1 Fleet fitment funding request for CP7 and number of units to be fitted, split by type of vehicle (2023-24 prices)

Fleet type	Proposed expenditure (£m)	Number of units to be fitted
Passenger	[redacted]	[redacted]
Freight	[redacted]	[redacted]
On Track Machines	[redacted]	[redacted]
Heritage and Charter	[redacted]	[redacted]
Total	[redacted]	[redacted]

Source: Network Rail's supplementary advice submission

4.7 We have carried out further analysis and reviewed the information provided by Network Rail between its initial CP7 submission and our supplementary advice. We have also received information from DfT which provides its views on progress with train operating companies (TOCs) and rolling stock leasing companies (ROSCOs).

Passenger fleet fitment ([redacted])

England and Wales

4.8 The LTDP outlines when sections of the rail network in England and Wales should be converted to ETCS operation. Since passenger services operate over defined routes, it is possible to link fleets of passenger vehicles to the signalling renewal of specific track sections. This then determines when vehicles need to be fitted with ETCS.

4.9 Network Rail has provided us with information that details all of the vehicle fitments that need to be carried out in CP7 in order to be ready for ETCS operation. In many cases that signalling will not be introduced until CP8, but the vehicle fitment programme is lengthy and fleet fitment needs to be completed in advance of the digital signalling renewal. We have not assured the fleet fitment programme and the assumptions included within. However, we consider Network Rail is taking a reasonable approach and that the fleet fitment should be commensurate with the CP7 renewals plan and CP8 workbank.

4.10 For each class of vehicles affected, Network Rail has considered which re-signalling project determines when they must be fitted. Network Rail has also identified the number of vehicles and the form of fitment required depending on the relevant digital signalling renewal. We understand DfT has shared information with Network Rail which outlines the initial plans for the procurement of new fleet and Network Rail has included these assumptions in its plans.

4.11 While it is possible to obtain accurate details of the current fleets operating, the plan for vehicle fitment has to anticipate future expenditure on fleet upgrades for deployment ten or more years ahead. This inevitably introduces many assumptions about what will be needed. The plan should therefore be treated as the current view of the future demands for ETCS fitment. This issue also highlights some potentially critical consequences of changing the future plans for vehicle utilisation. Any change to where vehicles are used will need to consider the effect on costs and timescales for ETCS fitment. In the long-term this becomes less of an issue because all current trains should be fitted with ETCS as part of the strategy set out in the LTDP and all new trains should be ordered with ETCS already fitted.

4.12 Note that we would expect CP8 funding would also include costs for the remaining passenger fleet fitments and that CP7 represents the beginning of this deployment.

Scotland

4.13 The passenger fleet for which funding has been requested in CP7 will predominantly operate in England & Wales. It will include some vehicles which operate on cross-border routes. Transport Scotland and Network Rail Scotland are developing plans for the procurement of a new fleet of suburban trains. We anticipate this fleet would be fitted with ETCS as standard to support the transition to digital signalling in future control periods in Scotland.

4.14 ***Advice: We consider the funding requested for passenger fleet fitment is commensurate with the extent of renewals planned to commence in CP7 and CP8 workbanks. We consider passenger fleet fitment could be funded via the PR23 process to ensure the delivery of this critical enabler for digital signalling.***

Freight fleet fitment ([redacted])

4.15 Freight locomotives are often described as “go anywhere” vehicles, meaning that they need to operate over the entire GB network. Whilst this is an over-simplification, it is true that, unlike passenger operations, they are not constrained to certain routes. Network Rail previously considered that the entire freight fleet would have to be fitted with ETCS before digital signalling renewals could be carried out. However, work by ECDP in conjunction with the freight sector identified only [redacted] of the national freight fleet would need to be fitted before the start of ETCS ‘no signals’ operation on the ECML. [redacted]. Network Rail should ensure the plan is commensurate with operational requirements and the digital signalling renewals it is planning to deliver.

4.16 The CP7 plan includes expenditure for the fitment of most of the remaining national freight fleet with a small cost anticipated in CP8 to complete the fitment programme.

4.17 [Redacted]

4.18 ***Advice: We consider it appropriate to include funding for freight fleet fitment in the PR23 process. This will safeguard existing commitments already made by funders for ECDP and support the future roll-out of digital signalling renewals. However, not all freight vehicles will require retro fitment as some existing classes may be retired before ETCS is deployed on certain routes.***

On Track Machines (OTMs) ([redacted])

4.19 On Track Machines (OTMs) are vehicles which are used to help maintain the network. As such, they will be required to access parts of the network which are transitioning to ETCS. ECDP has developed a plan for the fitment of OTMs which is similar to the freight fitment programme, such that a proportion of OTMs are to be fitted as part of that programme. [Redacted]

4.20 The fleet will be relatively expensive to fit because there are no large fleets of similar vehicles which means retro fitment will be more complex. Network Rail's plan for OTM fleet fitment assumes that it will not be appropriate to fit vehicles that are expected to be replaced in CP7 or CP8.

4.21 ***Advice: The strategy for OTM fitment is not as well developed as the freight and passenger fitment programmes. That said, it is important that funding is provided for the fitment of OTM vehicles alongside other fitment programmes in the PR23 process. Network Rail should ensure it dedicates resource to developing these plans further between now and the submission of its SBP so a decision can be made.***

Heritage and Charter (H&C) ([redacted])

4.22 Network Rail is using learning from ECDP, which has explored the technical and financial constraints to fitting ETCS to very old locomotives. The H&C plan that is currently funded via the RNEP and sits within the ECDP budget will take three H&C locomotives through the first-in-class (FiC) process, noting that when a unit is the first of its type to undergo fitment of ETCS equipment, this is usually more expensive than other types of fitment. This should develop greater understanding of the practicability of fitment.

4.23 Following these initial fitments, ECDP will determine if H&C fitment is feasible [redacted]. Network Rail should ensure the plan is commensurate with operational requirements and the digital signalling renewals it is planning to deliver.

4.24 There remains uncertainty about H&C fitment. These vehicles have existing rights to operate on the network. That said, it is harder to justify the fitment costs of H&C

vehicles. This is why the learning from ECDP is necessary to understand the feasibility of this fitment.

4.25 ***Advice: We consider funding for H&C fitment should be included within the PR23 process. However, this should be dependent on conclusions from the FiC feasibility fitment programme being carried out by ECDP. If fitment is not possible, we understand compensation may need to be considered for H&C operators in the event that operation of these services is no longer possible on the GB network.***

4.26 Suppliers and train operators need time to develop their own strategies for the fleet fitment programme. Confidence in the pipeline of work is also required. As such, the plan should be as robust as possible. Network Rail should provide sufficient transparency in its SBP submission of assumptions used to develop its programme and budgets. We consider these assumptions should be discussed with industry and endorsed by the appropriate board, e.g., Industry Council who oversee industry matters relating to digital signalling.

5. Review of option included by Network Rail in its initial CP7 submission to reduce passenger fleet fitment funding by c.£200m

5.1 As discussed in section 4 of this report, Network Rail included £1.2bn of funding for fleet fitment in its initial CP7 submission. This was split across passenger, freight, OTM, and H&C fleets.

5.2 Network Rail also included an option to reduce passenger fleet fitment funding by c.£200m and therefore defer some aspects of passenger fleet fitment into later control periods. This was referred to as part of its 'reduced cost option'. Network Rail did not clearly define the potential impacts of this option on affordability and deliverability at the time of our initial advice to the UK and Scottish governments. We asked Network Rail to provide more information in this respect so that we could carry out further assessment of this option.

5.3 This option is included in Network Rail's Eastern region's plan. As mentioned previously in this report, our views here relate to the inclusion of this funding in the PR23 process and not the allocation between England and Wales and Scotland. We therefore consider it appropriate to provide this advice to both DfT and Transport Scotland.

5.4 In June 2022, Network Rail led a workshop which presented basic illustrations to us on the potential quantitative impacts of reducing passenger fleet fitment funding. It also discussed the qualitative impacts that could occur if the total funding request of £1.2bn is not provided for fleet fitment during CP7.

5.5 Network Rail included multiple assumptions and caveats in its presentation to us. Many of these were due to external factors which could affect affordability and deliverability in future control periods for example supply chain capability to meet deliverability requirements.

5.6 Fleet fitment should be aligned to the infrastructure renewal plans and due consideration needs to be given to the volume of fleet fitment required to successfully deliver digital signalling renewals in CP7.

5.7 Reducing funding in CP7 by c.£200m could mean more signalling asset renewals in CP7 and CP8 will need to be renewed conventionally due to fleet fitment not having taken place for the planned digital signalling renewals. This assumes the fleet fitment programme is not delayed by other factors e.g., supply chain capacity or Network Rail's capability to deliver the programme to the agreed timescales.

5.8 As already discussed in this report, the volume of digital signalling renewals which are delivered is a critical driver for expected decreases in SEU rates across projects. This is because digital signalling renewals projects are required to develop the supply chain and help it to build its capability and capacity, consequently reducing unit rates.

Quantitative impacts of reducing passenger fleet fitment funding in CP7

5.9 There is a rising trend in conventional signalling SEU rates. It is highly likely this rising trend will get worse. However, more competition in the supply chain should reduce this trend. We recognised this in our signalling market study (Signalling market study – final report | Office of Rail and Road (orr.gov.uk)). We also note that digital SEU rates require sufficient competition in order for them to fall.

5.10 Based on analysis of the existing supply chain, Network Rail has estimated that three major digital signalling schemes per supplier (12 major schemes in total) are required to derive consistently lower unit rates than those that Network Rail is currently delivering.

5.11 Network Rail presented basic illustrations for two different scenarios. The first scenario, reduced fleet fitment by c.£200m, replacing it in CP8. The second scenario, reduced fleet fitment by c.£200m, replacing it in CP9. Network Rail has suggested that the first scenario could incur additional costs to industry of c.£2.6bn, whilst the second scenario could incur additional costs of c.£6.3bn based on whole life cost forecasts.

5.12 These additional costs initially seem high and have not been fully assured by Network Rail or ORR. We have, however, reviewed Network Rail's rationale and assumptions and we understand the calculations it has used to arrive at these additional costs. Table 5.1 below sets out the key drivers of these additional costs.

5.13 The majority of Network Rail's estimated cost increases are derived from the impact of having to renew the network conventionally instead of digitally in CP7

and CP8. Network Rail has assumed industry will find it difficult to lower unit rates without an aligned, incentivised supply chain delivering digital signalling renewals.

Table 5.1 Drivers of additional costs if funding for fleet fitment is reduced in CP7

Key drivers of additional costs	First Scenario	Second Scenario
Timeline for re-introduction of funding	Funding is replaced in CP8 which means passenger fleet fitment could catch-up by CP9	Funding is replaced in CP9 which means passenger fleet fitment could catch-up by CP10
Volume of conventional vs. digital renewals	CP8: 50% renewals are conventional CP9: majority of renewals are ETCS CP10: Industry is delivering volumes and rates consistent with steady state	CP8: 50% of renewals are conventional CP9: 50% of renewals are conventional CP10: majority of renewals are ETCS CP11: Industry is delivering volumes and rates consistent with steady state
Unit rate reductions don't materialise as quickly as expected	Unit rates fall more slowly than expected due to lack of industry experience in digital signalling renewals and the requirement for conventional renewals. Conventional rates may also increase due to technology obsolescence	Unit rates fall even more slowly than in scenario one. This is due to lack of industry experience in digital signalling renewals and the requirement for conventional renewals. Conventional rates may also increase due to technology obsolescence

Source: Network Rail supplementary advice submission

5.14 ***Advice: We cannot say with any degree of certainty that the additional costs estimated by Network Rail are accurate. That said, we accept that the additional costs to the industry would be much greater than the suggested £200m saving by reducing investment in fleet fitment in CP7. This is because the volume of fleet fitment is closely linked to the cost efficiency of delivering digital signalling renewals.***

Qualitative impacts of reducing passenger fleet fitment funding in CP7

5.15 The industry requires a transparent pipeline of digital signalling renewals so that the supply chain can build its capability and capacity to deliver. Linked to this, our recent signalling market study (November 2021) considered that a visible pipeline and committed funding is required so as not to inhibit potential competitors from entering the market and growing it organically.

5.16 The information provided by Network Rail indicated that unit rates could be higher if the transition to ETCS is delayed in CP7.

5.17 Network Rail estimates there are roughly five years required between funding / planning of fleet fitment programmes and the commissioning of an associated digital signalling renewal. We accept this logic given the learning from ECDP. This means fleet fitment should start as early as practicable to deliver the digital signalling renewals in Network Rail's CP7 plans.

5.18 We consider a reduction in passenger fleet fitment funding would slow the deployment of digital signalling renewals. This would impact on Network Rail's ability to renew the network digitally in CP7 and manage the signalling asset workbank in CP8. This in-turn leads to an impact on the cost efficiency of deploying digital signalling.

5.19 ***Advice: If passenger fleet fitment funding is reduced such that volumes fall below the volumes required to deliver the renewals identified for CP7 successfully, it will impact the digital signalling renewals which can be delivered in CP8 and beyond. This impact is difficult to quantify but we recognise the qualitative impacts such as supply chain readiness and the conclusions we made regarding competition in our signalling market study.***

6. Understanding OTTO

6.1 Network Rail has included expenditure in its initial CP7 submission for the Technical Authority's other renewals which support the deployment of digital signalling. One of these programmes is the development of Optimised Train Track Operations (OTTO). The development of OTTO has already started in CP6 and is in its very early stages. It is not tested or proven so the effect on future control periods is uncertain. We understand Network Rail will request funding to continue this development in CP7.

6.2 Network Rail anticipates funding for the development of OTTO in CP7 will come from funds allocated to the Technical Authority's 'other renewals' plans which is separate from R&D expenditure that is actually referred to as "R&D". The detail of funding being considered for OTTO is not currently available. Network Rail will need to ensure funding for R&D programmes is transparent and that it provides sufficient detail in its SBP submission.

6.3 The OTTO concept is based on a level within ETCS referred to as Limited Supervision (LS). It includes a range of options that are being developed by Network Rail which may assist with the migration to ETCS.

6.4 OTTO seeks to bring expanded functionality to existing systems using current on-board equipment such as Mk IV TPWS (Mark Four, Train Protection & Warning System) or AWS (Automatic Warning System) in conjunction with additional off-the-shelf components.

6.5 Network Rail is considering various options for further development in CP7, these are listed in Table 6.1 below:

Table 6.1 On-board and trackside options being considered as part of OTTO concept

Systems	Options	Description
On board systems	TPWS Flex	Uses existing class B system and additional positioning to detect sensors with a smart integrator and defined communications
	TPWS Flex+	As above, but with the addition of a Driver Machine Interface (DMI) to provide movement authorities

Systems	Options	Description
Trackside systems	ISLA (Isolated Speed Limited Authority)	A set of speed limits (permanent and temporary) that can be transmitted to a Flex or Flex+ train
	RBLS (Radio Based Limited Supervision)	As above, but with the inclusion of aspect information

Source: Network Rail

6.6 Network Rail is still developing its detailed strategy for OTTO so we don't currently know an accurate cost or the benefits that it may bring, partly due to the level of detail available. Network Rail should make sure its strategy is clear and both England & Wales and Scotland understand the benefits it could bring across their rail networks.

6.7 We consider OTTO is a promising development that may deliver benefits to early ETCS track fitments, or it could provide a temporary mitigation if there are delays to digital signalling renewals or cab fitment programmes. That said, the funding required to develop OTTO should be linked to the benefits it will deliver.

6.8 We understand train fitment for OTTO is simpler than for full retro fitment of existing fleet. Network Rail has estimated it could take approximately 2-4 days instead of two weeks to retro fit ETCS on-board equipment. This should deliver lower costs through trains being removed from the GB network for a shorter period of time.

6.9 Another benefit of OTTO is its modular based design, such that the system configuration can be aligned to the business needs of a route section / train operator.

6.10 Network Rail considers OTTO could provide additional safety and performance benefits in OTM vehicles and possession management strategies greater than those present in vehicles without ETCS. It will not however deliver the full benefits that ETCS will. The reason for these additional safety and performance benefits is due to greater control over vehicle management in and out of possessions.

6.11 We are conscious that OTTO and ETCS renewals could generate numerous changes for Network Rail's workforce to manage. Network Rail should consider whether this is the most efficient way of delivering the objectives of the programme, especially as OTTO solutions may be quickly followed by ETCS renewals.

6.12 We can see the advantages of including funding for OTTO in the PR23 process,. This is because it can support the transition to full ETCS in some areas, although we recognise it will only deliver partial benefits.

England and Wales

6.13 It is important that the deployment of ETCS continues due to the complex timings of infrastructure renewals compared with the upgrading of the fleets. OTTO allows for the introduction of increased functionality sooner, allowing for the fitment of the trackside ETCS infrastructure as the fleet would already be compatible with digital signalling. This will then bring the fuller ETCS capability as and when the new ETCS fitted trains are authorised to use the digital-ready infrastructure.

Scotland

6.14 The fitment of OTTO may benefit the network in Scotland. Network Rail is still developing the concept so it is not clear what the benefits will be or what areas of the network will benefit. We consider the fitment of OTTO at cross-border routes may bring safety and performance benefits though track fitment where rolling stock already fitted with ETCS travel to Glasgow and Edinburgh.

6.15 Further detailed analysis is required to understand the benefits that may be achieved for lower traffic and rural routes.

6.16 ***Advice: It is essential that the transition to full ETCS continues to progress. We consider that if OTTO is developed, tested and proven as part of Network Rail's R&D it may help to manage some of the affordability and deliverability challenges faced by Network Rail in future control periods by delivering partial solutions faster on the way to full ETCS in future.***

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