OFFICE OF RAIL AND ROAD

PR19 supplementary document: financial framework

ORR Periodic Review of HS1 Ltd 2019 (PR19) draft determination

30 September 2019

Contents

Introduction

Background

Our 2019 periodic review of HS1 Ltd (PR19) is the second periodic review of the 30-year Concession Agreement signed between the Secretary for State for Transport and High Speed 1 Ltd (HS1 Ltd) in 2009. This review covers Control Period 3 (CP3, 1 April 2020 – 31 March 2025). However, the implications of the financial decisions taken for CP3 extend into future control periods and beyond the end of the Concession Agreement.

The financial framework for CP3 should help to ensure that HS1 Ltd complies with its General Duty which requires it "*to secure in respect of the HS1 Railway Infrastructure: its operation and maintenance; its renewal and replacement; and the planning and carrying out of any Specified Upgrades and other upgrades, in each case:*

a) in accordance with best practice;

b) in a timely, efficient and economic manner; and

c) save in the case of the EdF Assets, as if HS1 Ltd were responsible for the stewardship of the HS1 Ltd railway infrastructure for the period of 40 years following the date that any such activities are planned or carried out,

subject to:

(i) the Safety Authorisation for HS1; and
(ii) the Capability Requirements."

Escrow account / renewals annuity

One of the key aspects of HS1 Ltd's financial framework is that an escrow account was set up in accordance with the Concession Agreement, to provide sufficient funds to pay for renewals expenditure across a rolling 40-year period. It is based on the principle that payments of the renewals annuity into the account equal the forecast average costs over time. This means that during low renewal expenditure periods the balance should grow to provide funds for when renewals expenditure is higher than the average level. Pre-funding renewals expenditure through the escrow account smooths payments and avoids step changes in the charges to operators.

The main focus of our financial assessment has been on the annual renewals annuity. In its final 5 Year Asset Management Statement (5YAMS), HS1 Ltd's Base Case forecast was that the renewals annuity would be £38.2m per annum (in February 2018 prices for

CP3), including the cost of a new signalling system (European Train Control System (ETCS).

This compared to:

- in Control Period 1 (CP1, comprising the first control period (1 April 2010 – 31 March 2015), the renewals annuity was set at £5.9m per annum (in 2012-13 prices); and
- in our periodic review of HS1 Ltd in 2014 (PR14), we said that the renewals annuity was not set at a level to adequately fund the escrow account. So, we increased the renewals annuity to £11.2m per annum for Control Period 2 (CP2) and said that further increases were expected, for CP3 to £16.4m, and to £17.4m for Control Period 4 (CP4) (all in 2012-13 prices) based on underfunding in CP1 and the renewals profile proposed in HS1 Ltd's asset management strategy at the time.

HS1 Ltd's proposed renewals annuity of £38.2m per annum (the HS1 Ltd Base Case) is around twice the expected CP3 renewals annuity anticipated by ORR in PR14 (the figure excluding ETCS is £35.3m per annum).The main drivers for the increase are the different approach taken by HS1 Ltd for risk and contingency and the inclusion of 'delivery integrator' costs[1].

In its final 5YAMS, HS1 Ltd also submitted two alternative proposals that recognised the impact of its proposals on operators. These included a renewals annuity calculation on a '20-year'[2] approach that gave a renewals annuity of £25.1m per annum, and a 40-year 'Buffer'[3] approach that gave a renewals annuity of £23.9m per annum for CP3 (both excluding ETCS).

Eurostar International Limited (EIL) submitted an alternative proposal for the renewals annuity calculation called the 'Ratchet'[4], which gives a renewals annuity of £22.5m per annum.

These alternative proposals are set out in more detail in Chapter 2.

[1] For CP4 onwards, HS1 Ltd proposes using a delivery integrator to undertake operations, maintenance and renewals. This arrangement would replace the Operator Agreement it has with NR(HS) for CP3.

[2] The '20-year' approach (also called Option 1 by HS1 Ltd) considers all costs but only over the next 20 years.

[3] The 'Buffer' approach (this is also called Option 2 by HS1 Ltd) uses direct costs over the 40-year period but non-direct costs (e.g. risk and contingency) are not funded after CP6.

[4] This proposal uses direct and delivery integrator costs from the next three control periods, accounting for 100% of CP3, 100% of CP4 and 50% of CP5 costs, i.e. it only considers costs over the next 15 years. It also includes an efficiency overlay of 0.5% per annum, an inflation assumption of 2.00% instead of 2.75% and only includes risk and contingency for CP3.

Financial risk

Assumptions for financial risk are included in expenditure to cover the possibility of costs being higher than expected. Our financial framework supplementary document considers financial risk in relation to the renewals annuity. But we have also set out below how financial risk is generally treated in PR19 and how the concession arrangements have affected it. The treatment of risk is important because operators rather than HS1 Ltd largely bear the main financial risks. In summary:

- there is an Annual Fixed Price contract with Network Rail (High Speed) Limited (NR(HS)) for operations and maintenance costs;
- it is largely not exposed to changes in renewals costs, because the funding comes from the renewals annuity and the Concession Agreement limits its exposure; and
- it is not largely not exposed to changes in pass-through costs (which can be significant).

HS1 Ltd is exposed to risk on its own costs but in comparison this is not as material.

Purpose of this document

In this document, we explain our assessment of the financial assumptions that HS1 Ltd has used within its final 5YAMs and the approach taken to calculating the annual CP3 renewals annuity. The calculation of the renewals annuity is determined by the cost and profile of renewals (inputs), as examined in our asset management document, as well as by the financial assumptions discussed in this document.

Important assumptions or decisions for CP3 (and beyond) which affect the renewals annuity include: distinguishing between renewals and Specified Upgrades (as Specified Upgrades are not included in the renewals annuity); the profile of renewals expenditure; the period of time to be considered; the assumptions relating to efficiency/productivity and financial risk and contingency; the balance on the escrow account compared to future expenditure; the treatment of the previous underfunding of the escrow account; and interest rate and inflation assumptions.

These assumptions and choices determine the size of the renewals annuity. The charging methodology determines how the renewals annuity is allocated across train operators who pay to use the HS1 network. In summary, HS1 Ltd charges train operators for the following costs:

- operating, maintenance and renewals (the renewals annuity not the renewals costs). These are recovered through Operating, Maintenance and Renewals Charges (OMRCs)[5], pass-through charges and freight-specific charges; and
- investment recovery charges, which recover the cost of the initial capital investment and the cost of the GSM-R Specified Upgrade.

We also provide our views on HS1 Ltd's own costs (subcontract and internal costs), pass-through costs and freight-specific costs and provide a summary showing overall costs. We also show what the total revenue is. Most of the operating, maintenance and renewal costs are covered in our asset management document[6] and in the draft determination.

We also discuss monitoring, reporting and outperformance issues.

Structure of this document

To explain our views on the above matters, this document is structured as follows:

- Chapter 1. Inputs into calculating the renewals annuity (i.e. the underlying renewals expenditure).
- Chapter 2. Financial assumptions for calculating the renewals annuity (period of time to be considered, efficiency/productivity, risk and contingency, CP1 and CP2 underfunding, negative[7] escrow balances and levels of escrow balances compared to future renewals expenditure).
- Chapter 3. Cost of capital, interest rates and inflation.
- Chapter 4. HS1 Ltd's subcontract, internal, pass-through and freight-specific costs.
- Chapter 5. Monitoring, reporting and outperformance.
- Chapter 6. Expenditure summary.
- Chapter 7. Our draft conclusions.

[5] This category of charge is broken down into specific charges as explained in our supplementary document setting out our charging and incentives draft findings.

[6] Our supplementary document setting out our asset management draft findings.

[7] In this document we refer to a negative escrow balance for ease of reading but the escrow balance cannot be negative. If there was not enough money in the escrow account to fund future renewals work, HS1 Ltd would have to finance the work itself.

Our comments and views are primarily based on the final 5YAMS submitted by HS1 Ltd on 31 May 2019, but where appropriate we have taken account of further evidence provided by HS1 Ltd as well as other stakeholders.

Unless otherwise stated, for comparability all numbers in this document are in the February 2018 price base provided in the HS1 Ltd final 5YAMS, and some numbers may not sum due to rounding.

1. Inputs into calculating the renewals annuity

Introduction

1.1. In this chapter, we summarise our draft findings on the renewals inputs into our renewals annuity calculation, separately for CP3, CP4-CP10 and in total for CP3-CP10.

1.2. The foundation for the renewals annuity, which is paid into the escrow account is the 40-year renewals profile set out in the final 5YAMS by HS1 Ltd. In our asset management document, we have recommended a profile of renewals work for CP3 and beyond. These recommendations propose:

(a) a renewals profile (the volume and frequency of renewals), which meets the HS1 Ltd General Duty; and

(b) an expected efficient cost profile associated with the renewals profile.

CP3 renewals inputs

1.3. In its final 5YAMS, HS1 Ltd forecast renewals expenditure of £100m[8] for CP3, comprised of £68m of direct costs, £18m (that is, 26% of direct costs) for risk and contingency, £9m of programme management office (PMO) costs and approximately £5m of preparation work for post CP3 renewals. Our preliminary view is that these costs are too high and in order for the final 5YAMS to be consistent with HS1 Ltd's General Duty, total renewals expenditure should be £68m for CP3. This would be comprised of £53m of CP3 direct costs, approximately £5m preparation costs for post CP3 renewals, £6m for risk and contingency priced at 13% of renewals of, and £5m for PMO costs.

1.4. The impact on the renewals annuity calculation of the differences in our view of CP3 renewals compared with HS1 Ltd's views are presented in Table 1.1. The key differences are that in our view:

(a) NR(HS)'s experience and the sufficiently routine nature of the CP3 renewals justifies a 13% risk and contingency assumption, rather than the 26% proposed by HS1 Ltd. This reduces the renewals annuity by £0.1m (see the risk and contingency section in Chapter 2);

[8] In HS1 Ltd's final 5YAMS, this was shown as £95.1m. But £99.8m was included in its renewals annuity calculation model because of work carried over from CP2 and in preparation for CP4.

(b) PMO costs should be 10% of renewals costs, which reduces the renewals annuity by £0.1m (see Table 1.1); and

(c) £12.9m of renewals should move from CP3 into CP4, along with some other CP3 differences this decreases the renewals annuity by £0.1m (see Table 1.1).

CP4-CP10 renewals inputs

1.5. The differences in our view of the renewals profile for CP4 to CP10 compared with HS1 Ltd's views are presented in Table 1.1 along with how they affect the renewals annuity calculation. They reflect:

(a) our view, that the conservative approach to asset life taken in the HS1 Ltd final 5YAMS for CP4-CP10, appears inappropriate. Consequently, we recommend a 10% reduction in renewals costs to represent a proportion of the assets that could be safely extended beyond their planned life. This results in a £1.4m per annum reduction in the renewals annuity. We have assumed the 10% Tier 2 management fee is retained;

(b) HS1 Ltd has not defined the organisation in which the project management function established in CP3 will sit for CP4 onwards. It could be part of HS1 Ltd or the delivery integrator; and

(c) HS1 Ltd's estimate for the delivery integrator model for CP4 to CP10 is £239m[9]. Our view is that the delivery integrator costs should be consistent with our CP3 recommendation. This approach means the integrator costs should be 20% of renewals (10% of the renewals costs and a 10% mark up for the integrator). This reduces the renewals annuity by £2.3m per annum.

Treatment of ETCS

1.6. In PR14, ETCS was categorised as a Specified Upgrade. This meant the funding stream for it was outside the scope of our final determination. For PR19, HS1 Ltd proposed in its final 5YAMS that ETCS should instead be considered as a renewal. As explained in our asset management document, our view is that it falls within the definition of a Specified Upgrade in the Concession Agreement and therefore should not be considered as a renewal. On this basis, we have excluded it from the renewals annuity calculation. However, if we decided to treat ETCS as a renewal we would need to consider what the effect on the renewals annuity would be for our final

[9] HS1 Ltd final 5YAMS, July 2019 Table 56, p107/8.

determination. Excluding it from the calculation reduces the renewals annuity by £2.9m per annum.

Table 1.1 ORR Asset Management proposed adjustments to HS1 Ltd's final 5YAMS

Asset Management proposed adjustments	Renewals Annuity impact (£m, Feb 2018 prices)
PMO costs reduced from 15% to 10% of renewal costs	-0.1
Other asset management changes with limited renewals annuity impact, such as transfer of CP3 renewal projects to CP4 and additional 1.8% CP3 efficiency (explained in Chapter 2)	-0.1
10% renewals volume reduction (CP4-CP10) to adjust for conservative approach to asset life	-1.4
Delivery integrator at 20% of renewal costs rather than fixed price (CP4-CP10)	-2.3
Total asset management proposed adjustments carried forward to the next chapter (excluding the risk and contingency adjustment) Note: the risk and contingency adjustment of £3.4m is also discussed in the asset management document, but in this document we have included it in Chapter 2. In total the asset management proposed adjustments (before ETCS) are £7.3m.	**-3.9**
Exclude ETCS	**-2.9**

Note: After all these proposed adjustments the renewals annuity is reduced to £31.4m (£38.2m - £3.9m - £2.9m).

Responses on renewals annuity inputs

1.7. The inclusion of ETCS as part of the renewals annuity was challenged by EIL on the basis that train operating companies on the mainline are not required to fund its roll out.

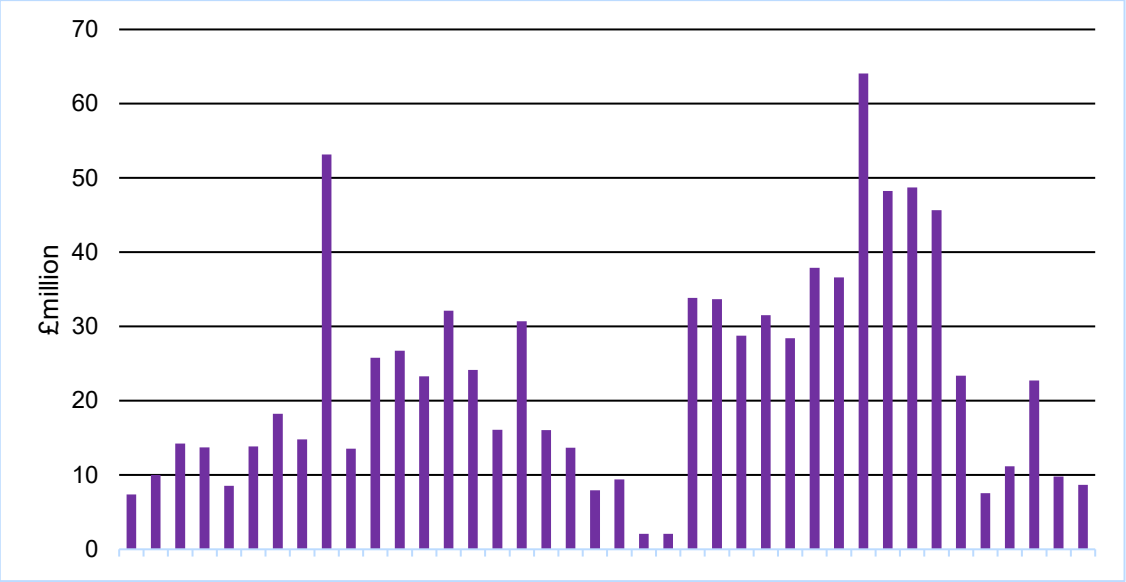
Our views on CP3-CP10 renewals annuity inputs

1.8. We set out our views on the ETCS project in our asset management document.

1.9. The total renewals costs, which are carried forward into the renewals annuity calculations in Chapter 2, are presented in Figure 1.1. This figure shows renewals costs including our proposed adjustments to HS1 Ltd's final 5YAMS set out in this

chapter and shown in Table 1.1. For the first 20 years (CP3 to CP6) renewals are £433m, and in the last 20 years of the 40-year forecast they are £592m. Over 40 years renewals costs are expected to be around £1.0bn.

Figure 1.1 Total renewals costs, (£m, February 2018 prices), with ORR proposed input adjustments and efficiency overlay[10] (before risk and contingency)



Source: ORR's review of HS1 Ltd's renewals plan for CP3-CP10 in its final 5YAMS.

[10] The efficiency overlay is explained in Chapter 2.

2. Financial assumptions for calculating the renewals annuity

Introduction

2.1. In this chapter we:

(a) summarise HS1 Ltd's renewals annuity proposals and compare its Base Case to PR14;

(b) consider the appropriate level of efficiency that we are proposing should be included in the calculation;

(c) consider the appropriate level of risk and contingency funding that we are proposing should be included in the calculation;

(d) consider how we are proposing to take account of previous underfunding and how we can avoid future negative[11] escrow balances;

(e) explain that some costs were omitted from HS1 Ltd's final 5YAMS; and

(f) conclude with our recommendation for the level of the renewals annuity.

Background

2.2. The escrow account was set up to provide sufficient funds to pay for renewals across a rolling 40-year period. It is based on the principle that payments into the account from the renewals annuity equal the forecast average costs over time. This means that during low renewal expenditure periods the balance should grow to provide funds for when renewals expenditure is higher than the average.

2.3. Pre-funding renewals expenditure through the escrow account smooths payments and avoids step changes in the charges to operators. In order for this to work well, it should also incentivise accurate costing and encourage efficient practices. The periodic review process means that all stakeholders can assess every five years how well these aims are met.

[11] In this document we sometimes refer to a negative escrow balance for ease of reading. But the escrow balance cannot be negative. If there was not enough money in the escrow account to fund future renewals work, HS1 Ltd would have to finance the work itself.

2.4. In PR14, HS1 Ltd recognised that the 40-year forecast level of renewals expenditure needed to increase[12]. In our final PR14 determination, we agreed with HS1 Ltd's proposal to phase in the increase in the renewals annuity that would cover the renewals expenditure for the next 40 years (and result in a zero closing balance on the escrow account at the end of the 40-year period). This meant that the renewals annuity was set at the level of HS1 Ltd's proposal of £11.2m per annum (in 2012-13 prices) for CP2 and the expected payments were £16.4m per annum for CP3 and £17.4m per annum for CP4 onwards (both in 2012-13 prices). We also noted that the underlying level of renewals may change resulting in a need to review the renewals annuity for future control periods.

2.5. During CP2, the escrow account is forecast to grow from £33.6m to £75.9m (both in nominal prices) as shown in Table 2.1. If it had been set to catch up the full CP1 underfunding, the escrow balances would be higher.

Table 2.1 Escrow account balances in CP2

Escrow account (£m, nominal prices)	2015-16	2016-17	2017-18	2018-19	2019-20 forecast
Opening balance	**33.6**	**45.5**	**56.4**	**66.4**	**78.3**
Transfers in	11.9	11.9	12,0	12.5	13.4
Withdrawals	(0.3)	(1.8)	(2.1)	(1.6)	(16.9)
Interest earned	0.2	0.8	0.1	0.9	1.1
Closing balance	**45.5**	**56.4**	**66.4**	**78.3**	**75.9**

Source: Table 26 from HS1 Ltd's final 5YAMS.

Renewals annuity calculation method

2.6. We have calculated our view of the renewals annuity using a financial model developed by Oxera for HS1 Ltd, which we have reviewed. This model takes inputs such as annual renewals expenditure and financial assumptions, such as the escrow balances, annual payments into the account, inflation and returns on investments, to calculate the renewals annuity over a 40-year period. The annuity is based on the principle that payments of the renewals annuity into the account equal the forecast average costs over time.

[12] For example, HS1 Ltd made an initial renewals annuity proposal of £23.5m (2012-13 prices) in its PR14 draft 5YAMS consultation. See HS1 Ltd Five Year Asset Management Statement Consultation 18 October 2013

2.7. Important assumptions or decisions for CP3 (and beyond) which affect the renewals annuity include:

(a) distinguishing between renewals and Specified Upgrades (as Specified Upgrades are not included in the renewals annuity);

(b) the profile of renewals expenditure;

(c) the period of time to be considered;

(d) the assumptions relating to efficiency/productivity and financial risk and contingency;

(e) the balance on the escrow account compared to future expenditure;

(f) the treatment of the previous underfunding of the escrow account; and

(g) interest rate and inflation assumptions.

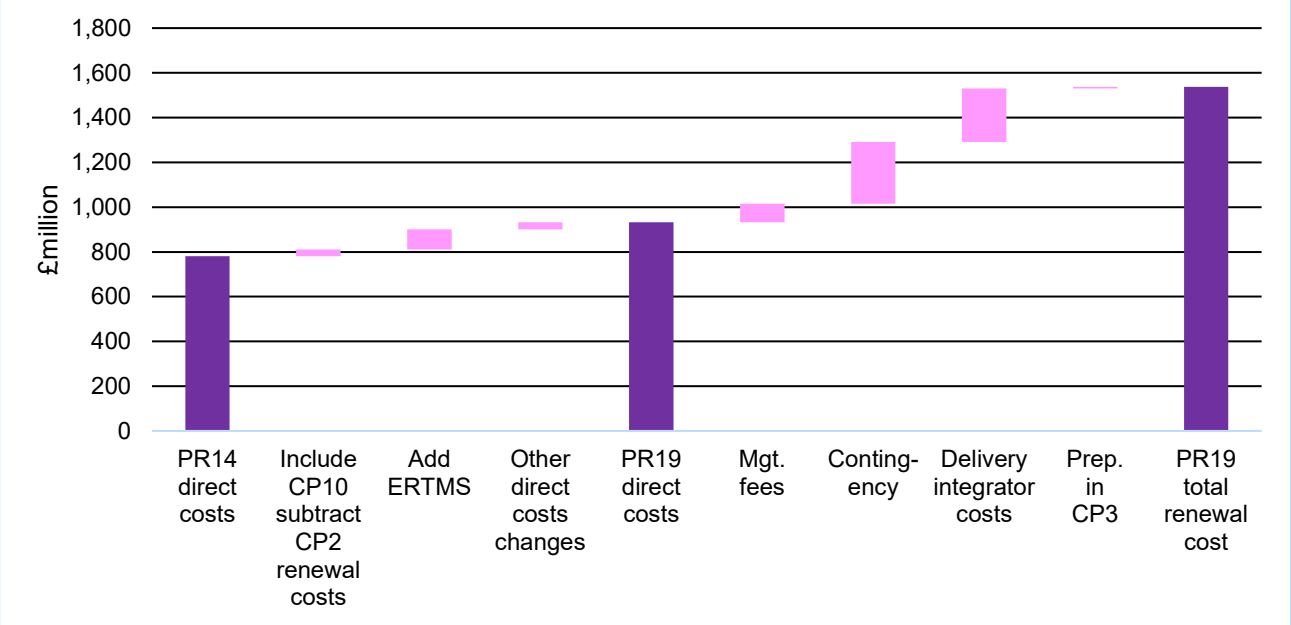
2.8. It is also important to recognise that setting the renewals annuity is not a 'one-shot' game. At each periodic review better information on renewals expenditure on a rolling basis will be available. This will allow the renewals annuity to be based on the best estimates of efficient costs over a planning period.

HS1 Ltd's final 5YAMS renewals annuity summary

HS1 Ltd's Base Case

2.9. Figure 2.1 shows how HS1 Ltd's forecast renewal costs have increased between PR14 and PR19 for a 40-year renewal period. The largest contributions to the increase in the renewals annuity are the inclusion of risk and contingency (labelled contingency in this figure) and the inclusion of the delivery integrator costs.

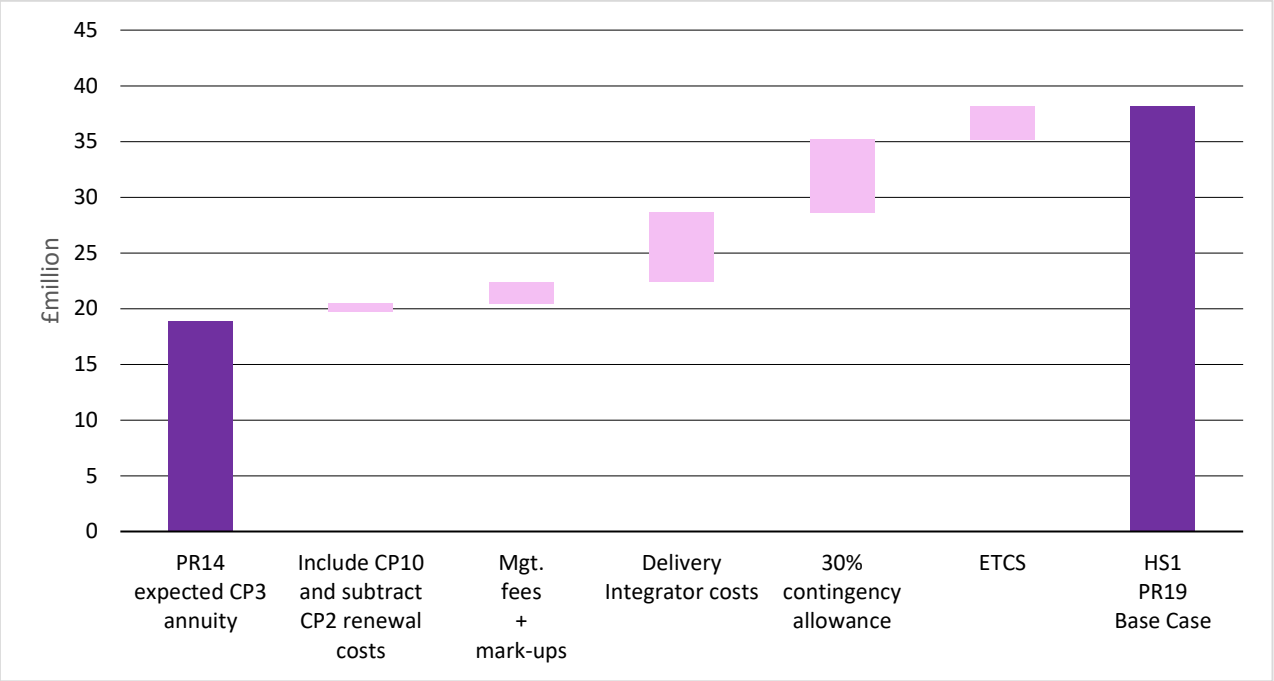
Figure 2.1 HS1 Ltd's summary of PR19 renewals cost increases (February 2018 prices)



Source: Figure 29 in HS1 Ltd's final 5YAMS.

2.10. A comparison of HS1 Ltd's final 5YAMS Base Case proposal for CP3 with the PR14 expected renewals annuity is shown in Figure 2.2. It shows the impact from: the introduction of CP10 and exclusion of CP2 in the 40-year period. It also shows the effect of including ETCS, management fee and mark-ups, risk and contingency (just called contingency in figure 2.2), and delivery integrator costs.

Figure 2.2 Differences between PR14 expected CP3 renewals annuity and HS1 Ltd's final 5YAMS Base Case proposal (February 2018 prices)



Source: HS1 Ltd's final 5YAMS and ORR's calculations.

HS1 Ltd's alternative options

2.11. In its final 5YAMS, in addition to its Base Case, HS1 Ltd provided two alternative approaches for calculating the renewals annuity: one based on a '20-year' approach (that only considers costs over the next 20 years) and the other a 'Buffer' approach. In the 'Buffer' approach, direct costs are funded over the 40-year period. Non-direct costs (of which risk and contingency is one) are not funded after CP6. These options were HS1 Ltd's response to stakeholders' responses to consider shorter time periods and their concerns over the impact of the charges on them.

2.12. We provide our view on these options and issues in the draft findings section below.

Responses on the time period for the renewals annuity

2.13. A number of respondents questioned the significant increase between the expected renewals annuity set out in PR14 and that proposed in HS1 Ltd's draft 5YAMS and its final 5YAMS.

2.14. Freight and passenger train operators did not support a 40-year approach for calculating the renewals annuity. Freight respondents suggested that it did not fit with market can bear considerations as explained in our charges and incentives supplementary document, so said a five-year option should be employed for them. Passenger operators suggested 20-year or shorter periods based on their view that it

is not necessary to pay forward for 40 years and noting that European networks have shorter pay-forward periods.

2.15. EIL submitted an alternative proposal for the renewals annuity calculation called the 'Ratchet'. This proposal uses direct and delivery integrator costs from the next three control periods, accounting for 100% of CP3, 100% of CP4 and 50% of CP5 costs, i.e. it only considers costs over the next 15 years. It also includes an efficiency overlay of 0.5% per annum, an inflation assumption of 2.00% instead of 2.75% and only includes risk and contingency for CP3.

Our draft findings on the time period for the renewals annuity

2.16. We address the issues that respondents raised on the overall level of the renewals annuity by addressing each factor in turn and providing our overall draft findings in the overall renewals annuity draft findings section at the end of this chapter.

2.17. While the cost profile over 40 years has a degree of uncertainty surrounding it, the Concession Agreement is clear that a 40-year planning period should be used. Also, the 40-year calculation smooths the financial impact on operators and is more consistent with the principle that users should pay for their use of the assets and supports inter-generational equity. Therefore, our draft finding is that the input costs for the calculation of the renewals annuity should be considered over a 40-year period.

2.18. A renewals annuity calculation over 20 years is not consistent with the principle of the user paying for the use of the asset because some of the assets they are using today will not be renewed in the next 20 years. Figure 1.1 uses renewals costs including our proposed adjustments set out in Chapter 1 of this document and our efficiency overlay adjustment but is before risk and contingency. It shows that a 20-year renewals calculation period for CP3 to CP6 has renewals costs totalling £433m. However, the more expensive last 20 years of the 40-year forecast (with a further £592m of costs) would be excluded. Delaying the inclusion of the more expensive control periods will mean them being paid for over a shorter timeframe and increases the chance of increases in the renewals annuity in the future.

2.19. In our opinion, the 'Ratchet' approach has similar problems to the HS1 Ltd 'Buffer' approach. This is because it ignores costs which will occur in the future, but are a result of the operation of trains now and in the past, and need to be funded. Given the relatively high cost of renewals which take place after CP5 this means that using the 'Ratchet' approach would lead to increases in the renewals annuity for future control periods. Our view on the inflation assumption in EIL's 'Ratchet' approach is set out in Chapter 3.

Efficiency for the renewals annuity

HS1 Ltd's position

2.20. HS1 Ltd's forecast renewals costs are based on NR(HS) forecasts for CP3, and the Bechtel work for CP4 onwards, as discussed in the asset management supplementary document. It is not clear the extent to which NR(HS) has proposed challenging efficiency targets as it has said efficiencies are embedded within the forecasts. This may be a consequence of NR(HS) not providing a long-term renewals forecast and not suggesting how it proposes to invest in CP3 to drive efficiencies in the future.

2.21. HS1 Ltd has said that it challenged Bechtel to include frontier shift/productivity assumptions for CP4 onwards in its forecast. HS1 Ltd has concluded that the efficiency (including future productivity) assumptions are embedded within the forecasts and are sufficiently challenging.

ORR's assessment of efficiency

2.22. In our asset management supplementary document, we considered Rebel's benchmarking analysis of NR(HS), which covered operations, maintenance and renewals costs in CP3. Rebel proposed an efficiency improvement of 18% on total costs. But it is not clear how renewals contribute to the efficiency challenge for CP3 included in HS1 Ltd's final 5YAMS. So, based on our analysis, we have included an additional 1.8% challenge for CP3 (not per annum)[13].

2.23. We also noted in our asset management supplementary document, that the renewals costs for CP4 onwards contained a range of factors which could push costs up or down. We consider a high performing commissioner to expect its delivery integrator to seek out efficiencies. The HS1 Ltd best estimate of total contracted costs is £831m (£921m minus £90m for ETCS). We expect HS1 Ltd to drive improved commercial arrangements, contestability in contracts, operational efficiencies and innovation through technology shifts.

2.24. We are mindful of how the estimated cost base could change, while at the same time the risk and contingency uplift protects HS1 Ltd and a delivery integrator from inefficiency, for example, from inefficient commercial arrangements. Our efficiency challenge needs to take these factors into account.

[13] We also note that HS1 Ltd's NR(HS) maintenance and renewals efficiency challenge is lower than the one that we set out for Network Rail Infrastructure Limited in our 2018 periodic review. See ORR periodic review of Network Rail Infrastructure Limited 2018

2.25. One of the ways of thinking about efficiency or productivity challenges, would be to firstly consider the efficiency gap (catch up) to a real or hypothetical competitor at the 'efficient frontier' or other points such as the upper quartile. Then frontier shift[14] could be considered.

2.26. We have considered the efficiency challenges within rail and other similar industries. For example, in our PR18 final determination for Network Rail Infrastructure Limited, we proposed efficiency challenges of 10% for England and Wales and 11% for Scotland[15]. In Ofwat's periodic review 2019 draft determinations for water and sewerage companies, the efficient cost challenge set by Ofwat is 11%[16]. In Ofgem's last published review (RIIO-DE1[17]), it identified large cost variations indicating inefficiencies in eight of ten slow-track electricity distribution network operators (DNOs). However, the analysis is difficult to translate to HS1 Ltd.

2.27. It is also useful to compare frontier shift in other regulated industries. Our research shows that water and sewerage companies are expected to seek out a frontier shift productivity change of 1.5% per annum between 2020-21 and 2024-25[18]. In RIIO-T1/GD1[19], Ofgem's ongoing efficiency challenge for gas distribution networks (GDNs), National Grid Electricity Transmission (NGET) and National Grid Gas Transmission (NGGT) captures productivity improvements it expects even the most efficient company to make (similar to frontier shift). It found a 1.0% efficiency improvement per annum was appropriate for operating expenditure, and 0.7% for capital and replacement expenditure.

2.28. We recognise that there are some differences between Network Rail Infrastructure Limited, other regulated industries and HS1 Ltd. However, they all face similar challenges in their industries to seek out efficiencies. In light of this and the fact we are applying this assumption over a 40-year period we have been relatively cautious.

[14] This describes a change in productivity that arrives from new ways of working or adopting new technology.

[15] ORR periodic review of Network Rail Infrastructure Limited 2018 final determination, p152, para 7.45.

[16] Wholesale and Retail Water companies - Ofwat PR19 draft determination securing cost efficiency technical appendix, p102, Annex 1, Table A1.1.

[17] Revenue, Incentives, Innovation and Outputs - Electricity Distribution price control - Ofgem RIIO-ED1 draft determinations for the slow-track electricity distribution companies

[18] Wholesale and Retail Water companies - Ofwat PR19 draft determination securing cost efficiency technical appendix, p29, Table 6.

[19] Revenue, Incentives, Innovation and Outputs - National Grid Electricity, National Grid Gas, and Gas Distribution Networks price control - Ofgem RIIO-T1/GD1 appendix on real price effects and ongoing efficiency

Responses on efficiency

2.29. Efficiency was raised in a number of consultation responses to HS1 Ltd's draft 5YAMS. In particular, respondents raised the following issues:

(a) The need to bring forward efficient practices for CP3.

(b) Having an efficiency overlay. One respondent said the 0.6% applied in CP2 was a precedent, which should be considered for CP3 onwards.

(c) The inclusion of an efficiency frontier shift or lessons on efficiency from HS2/other rail developments.

(d) That risk/contingency could be used to provide an incentive for HS1 Ltd to deliver as efficiently as possible.

Our draft findings on efficiency

2.30. The general view of respondents on efficiency/productivity, is that they consider HS1 Ltd's assumptions to be insufficient. We agree with this.

2.31. HS1 Ltd's final 5YAMS noted improvements to project delivery and governance by NR(HS). However, there does not appear to be a strong incentive to drive efficiency in NR(HS) / the delivery integrator. We welcome views on this in addition to other issues raised in our Escrow discussion document[20].

2.32. With regards to HS1 Ltd challenging Bechtel to include frontier shift/productivity assumptions for CP4 onwards without explicit evidence of the technological changes or productivity assumptions that were considered, we cannot agree with this conclusion. For our 2024 periodic review (PR24), we expect HS1 Ltd to build its own evidence base for productivity.

2.33. Based on the evidence of our assessment of asset management, we think the efficiency challenge identified by Bechtel is not sufficient. In order to ensure the final 5YAMS is consistent with HS1 Ltd's General Duty, we consider that it would be reasonable for HS1 Ltd to apply a frontier shift of 0.5% per annum to its renewals costs forecasts from CP4. We have included this in our calculation of the renewals annuity[21]. In simple terms, this equates to around 2.5% efficiency for each control period from CP4 onwards, as we consider the 1.8% efficiency adjustment in CP3 sufficient.

[20] Discussion document: HS1 Escrow arrangements – financial risks, incentives and governance

[21] We note that EIL proposed a 0.5% per annum frontier shift in its 'Ratchet' approach.

2.34. The impact of this efficiency overlay is shown in Table 2.2.

Table 2.2 Efficiency overlay/frontier shift impact on renewals annuity

Renewals Annuity adjustment with regard to £31.4m[22]	Renewals annuity impact (£m, Feb 2018 prices)
Efficiency overlay/frontier shift CP4-CP10 of 0.5% per year	-2.6

Financial risk and contingency

HS1 Ltd's position

2.35. HS1 Ltd proposed a 26% allowance for financial risk[23] and contingency for CP3, and 30% for CP4-CP10 on top of the total forecast contracted costs. The final 5YAMS states the CP4-CP10 forecasts are based on the Bechtel global database. Our assessment and draft conclusions are contained in our asset management document. In summary, we do not think that the risk and contingency assumptions have been adequately justified.

2.36. In response to respondents concerns over the impact of the proposed increase in charges, HS1 Ltd produced two alternatives to the Base Case. In the '20-year' approach, risk and contingency is set at 26% for CP3 and 30% for the following 15 years. No underlying costs or risk and contingency funding are provided after 20 years. In the 'Buffer' approach, direct costs are funded over the 40-year period. But non-direct costs (of which risk and contingency is one) are not funded after CP6. This reduces the total amount of risk and contingency funding from £263m in the Base Case (excluding ETCS) to £104m with the '20-year' approach and £20m with the 'Buffer' approach. It also means that the basis of the expenditure that goes into the calculation of average renewals costs is different for the two different time periods, so are not consistent with each other.

[22] This is the £31.4m renewals annuity level after the adjustments in Chapter 1.

[23] Assumptions for financial risk are included in expenditure to cover the possibility of costs being higher than expected.

Table 2.3 Risk and contingency in HS1 Ltd's final 5YAMs

Options		CP3 Risk %	CP4-5 Risk %	CP6-CP10 Risk %	Renewals annuity excluding ETCS (£m)
HS1 Ltd Base Case		26%	30%	30%	35.3
HS1 Ltd '20-year' approach		26%	30%	30% Only CP6	25.1
HS1 'Buffer' approach	**Direct Costs**	26%	30%	0%	23.9
	Non-direct costs	26%	30%	0% All costs excluded from calculation	

Source: HS1 Ltd's final 5YAMS.

Responses on risk and contingency

2.37. EIL viewed the high uncertainty in costs for CP4 onwards as problematic given the time taken to agree CP3 numbers. In its view this issue is compounded by HS1 Ltd not being sufficiently exposed to forecasting risk, which sits with operators. Again, because the allocation of risk is set out in the Concession Agreement, it would need to be amended to address these issues.

2.38. The EIL alternative proposal for the renewals annuity calculation, called the 'Ratchet', uses costs from the next three control periods but excludes risk and contingency in CP4 and CP5 (it only includes it for CP3). In only considering costs over the next 15 years and risk in CP3, no costs or risk and contingency are included beyond those respective periods.

Our draft findings on risk and contingency

2.39. The uncertainty surrounding renewals projects means that it is necessary to fund risk and contingency, for example, to cover cost shocks. However in our view, HS1 Ltd's assumptions on financial risk and contingency are too cautious. In particular, we note that when the projects in CP4-CP10 are scoped they will be less uncertain than they are now and will require less risk and contingency funding.

2.40. Given the lack of evidence for HS1 Ltd's risk and contingency assumption of 26% for CP3 and 30% for CP4-CP10, and for the reasons set out above, we think that a more appropriate approach would be to use our CP3 risk and contingency assumption of

13% for CP4-CP10 as well, i.e. for the whole 40-year renewals annuity period. The effect of this proposed adjustment on the renewals annuity is shown in Table 2.4 below.

2.41. Our assumption of 13% is based on our asset management assessment for CP3, as set out in our asset management supplementary document. Although there may be cost factors outside of its control, we expect HS1 Ltd to take ownership of and manage those risk and cost factors which are within its control.

Table 2.4 Impact of risk and contingency adjustments (following renewals input and efficiency adjustments)

Renewals Annuity proposed adjustment with regard to £28.7m[24]	Renewals Annuity impact (£m, Feb 2018 prices)
CP3 risk and contingency of 13% not 26%	-0.1
CP4-10 risk and contingency of 13% not 30%	-3.3

2.42. Using our 13% assumption for risk and contingency, funds around £102m of risk and contingency over 40 years. This is lower than HS1 Ltd's assumption in its Base Case of £263m, similar to HS1 Ltd's '20-year' approach which funds £104m and higher than its 'Buffer' approach which funds £20m.

Escrow account balances

Background

2.43. The renewals cost profile is uneven. This means that because renewals costs are funded using a 40-year average, there can be some years that have higher escrow balances.

2.44. Payments in CP1 and CP2 have been lower than the current forecast average renewals costs, so the escrow balances are lower than they need to be to fund future renewals expenditure.

Responses on escrow balances

2.45. Passenger operators have highlighted the relatively low forecast returns on Authorised Investments and the escrow account[25]. However, the process around Authorised Investments is set out in Appendix 1 of Schedule 10 to the Concession

[24] This is the £31.4m renewals annuity level less the £2.6m proposed efficiency adjustment.

[25] Passenger operators considered HS1 Ltd could earn a higher return on the funds.

Agreement and therefore to address this concern, would require the Concession Agreement to be amended.

Our draft findings on escrow balances

2.46. We have updated our analysis of the escrow account in light of the new information provided for CP3. Using a CP3 consistent methodology for CP1 and CP2, the escrow balance would have been around £130m higher at the end of CP2. This figure would be around £85m if the delivery integrator and PMO costs are excluded (as they were in PR14).

2.47. Using HS1 Ltd's Base Case methodology, each time the renewals annuity is calculated it automatically incorporates part of the underpayment from previous periods and spreads this over the next 40 years. However, we think catching up to the appropriate escrow balance should take place during the term of the Concession Agreement (between CP3 and CP6) to align with the principle of "user pays" and to support inter-generational equity. In order to do this we recommend increasing the renewals annuity by £1.2m[26]. Without this adjustment there would be circa £24m to catch up by the end of the Concession Agreement, as a result of the underfunding of the escrow account in CP1 and CP2.

2.48. Throughout our assessment we have considered the impact of our draft findings on the escrow balances. This is in light of the underfunding from CP1 and CP2, but also because cost shocks will occur and the renewals cost profile is lumpy. That is why in this draft determination we are placing a strong emphasis on HS1 Ltd building an escrow balance in each control period, which smooths the renewals annuity and avoids negative escrow balances in the future[27]. To achieve this we recommend increasing the renewals annuity by £0.4m[28] to remove the negative balances in future periods. Adding the £0.4m adjustment for negative escrow balances to the £1.2m adjustment for underfunding in CP1 and CP2 produces a total £1.6m adjustment for escrow balances.

2.49. We have updated our analysis of the cost of capital, interest rates and inflation in Chapter 3 of this document. The resulting impacts on the renewals annuity are shown in this section where they are material.

[26] This is with respect to a renewals annuity of £24.5m, i.e. the £28.7m renewals level referred to in Table 2.4 less the reductions for risk and contingency of £0.1m and £3.3m and the interest rates reduction of £0.9m.

[27] Technically a negative balance on the escrow account is not possible. If there was not enough money in the account to fund future renewals work, HS1 Ltd would have to finance the work itself. This is unlikely to be efficient. To avoid this we should adjust charges so there is enough money in the escrow account to fund the work. Making this adjustment now allows the effect to be better smoothed over time.

[28] This is with respect to a renewals annuity of £25.7m. This is the £24.5m renewals annuity level from footnote 26 plus the £1.2m increase for underfunding in CP1 and CP2.

2.50. The HS1 Ltd renewals annuity calculation targets a zero escrow balance at the end of CP10. This approach simplifies the renewals annuity calculation but it does not consider that operators will have had the use of some assets that will be renewed after the end of the 40-year period. For example, in our proposed adjustments for asset life we have suggested 10% of renewal costs could move out of the 40-year period (this is approximately £40m). At the end of CP10, the escrow balance should be around £64m, and will provide sufficient funds to cover those renewals costs.

2.51. To ensure that there are no negative escrow balances in the future, we also need to enhance HS1 Ltd's reporting of renewals expenditure, this is also discussed in Chapter 5. This will provide better information and reputational incentives on HS1 Ltd and its partners to improve forecasting and use escrow funds efficiently. In our view this is the best approach to enable HS1 Ltd to deliver its asset stewardship obligations.

2.52. Our recently published discussion paper on HS1 Ltd's escrow arrangements[29] also highlights possible improvements to the escrow arrangements to ensure that risks related to the use of escrow funds are efficiently allocated between parties. This would have the effect of improving incentives to keep renewal costs at efficient levels reducing further the possibility of negative escrow balances.

Costs omitted from HS1 Ltd's final 5YAMS forecast

2.53. HS1 Ltd used Bechtel's forecasts for its 40-year renewals profile. Bechtel omitted some costs such as enabling works on additional depots/sidings and clean-up costs. HS1 Ltd may have assumed that some of the 30% contingency and risk funding would cover these costs, although this is not stated in its final 5YAMS. The Frazer Nash report that we commissioned stated that a 30% risk and contingency uplift would cover these costs.

2.54. This is not a transparent approach to derive a renewals cost forecast and distorts the balance between direct and non-direct costs. It also affects the timing of when expenditure is included in the 40-year calculation. This is because it is unlikely that the omitted costs will have the same profile as the underlying renewals expenditure forecast and presumably these omitted costs will relate more to the later control periods than the early control periods. Whereas, risk and contingency has been applied as a percentage uplift on the renewals costs by HS1 Ltd and in our assumption. Also, if the underlying costs are not as robust as we would expect them to be, then it is unlikely the risk and contingency forecast will be either, because they are estimated based on the underlying costs.

[29] Discussion document: HS1 Escrow arrangements – financial risks, incentives and governance

2.55. The costs that have been omitted from the HS1 Ltd forecast demonstrate that the forecast needs to improve. In PR24, we expect HS1 Ltd to produce a more robust renewals forecast for CP4 onwards.

Our overall draft findings on the renewals annuity

2.56. In Chapter 1, we set out our proposed adjustments to renewals inputs for the renewals annuity calculation. In this chapter, we have provided proposed adjustments for efficiency, risk and contingency, underfunding in CP1 and CP2 and to avoid negative escrow balances. All these draft findings are applied to the HS1 Ltd Base Case (excluding ETCS).

2.57. The Concession Agreement requires HS1 Ltd to take a 40-year approach to renewals. So, in our opinion, HS1 Ltd's '20-year' approach and EIL's 'Ratchet' approach (which looks at the next 15 years) are not consistent with the Concession Agreement and HS1 Ltd should calculate the renewals annuity on a 40-year basis. Using a 40-year period better covers the life of the entire asset base and better smooths the peaks and troughs in expenditure over time[30], than a shorter time span does. This means the financial impact on operators will also be better smoothed over time.

2.58. HS1 Ltd's 'Buffer' and EIL's 'Ratchet' approaches have the disadvantage of excluding costs that will occur in the future and need to be funded. Some of these costs are the result of operating trains now and in the past, so need to be funded. But they also exclude other costs that will happen in the future, e.g. costs shocks will happen on the renewals costs that HS1 Ltd has included in the calculation for years 11-40 as well as years 1-10[31]. Reducing the period over which these costs are paid for, will mean increases in the renewals annuity in the future, which may worsen the impact on operators.

2.59. None of the three alternative approaches are consistent with the principle that users should pay for the use of the asset and support inter-generational equity as some renewals will not take place until after year 20 but the operators are using the assets now and the full costs of renewals should be funded not just the direct costs.

2.60. Table 2.5 summarises our, HS1 Ltd's and EIL's proposals on the renewals annuity and whether they are consistent with the 40-year outlook prescribed in the

[30] This is especially the case given the relatively high cost of renewals which take place after CP5, which would lead to increases in the renewals annuity for future control periods.

[31] Another example is that it is reasonable to assume a management fee is paid in the future (if the current arrangements for the delivery of renewals are in place) and not just for the next 10 years as in the 'Buffer' approach.

Concession Agreement and include all categories of costs. The table shows that the only two approaches that are consistent with the Concession Agreement, and include all categories of costs, are HS1 Ltd's Base Case and our approach. The main difference between these two approaches is that on most issues we think that HS1 Ltd's assumptions are too conservative, e.g. on asset life. It is only the proposed adjustments for underfunding in CP1 and CP2 and to avoid negative escrow balances in CP9 and CP10 that reflect a different methodology.

Table 2.5 Summary of ORR, HS1 Ltd and EIL's proposals on the renewals annuity

Renewals Annuity options (£m, February 2018 prices)	Renewals Annuity (excluding ETCS) per annum £m	Is the approach consistent with the Concession?	Does the approach include all categories of costs?
HS1 Ltd Base Case	35.3	Yes	Yes
HS1 Ltd '20-year' approach	25.1	No	Yes
HS1 Ltd 'Buffer' approach	23.9	Yes	No
EIL 'Ratchet' approach	22.5	No	No
ORR adjustments[32]	26.1	Yes	Yes

2.61. Figure 2.3 and Table 2.6 show that the recommended ORR renewals annuity is £26.1m and the proposed adjustments[33] made to arrive at that figure, starting with HS1 Ltd's Base Case. We note that the level of the renewals annuity is similar to the alternative levels proposed by HS1 Ltd and EIL[34].

2.62. We have not adjusted the renewals annuity for costs that HS1 Ltd has omitted from its forecasts, e.g. some enabling works on additional depots/sidings and clean-up costs as HS1 Ltd does not have a forecast of them. This would increase the renewals annuity. However, we are conscious that our interest rates forecast is likely to be conservative, especially after 20 years, as interest rates are historically low (see

[32] This line shows the effect of ORR's adjustments to HS1 Ltd's Base Case.

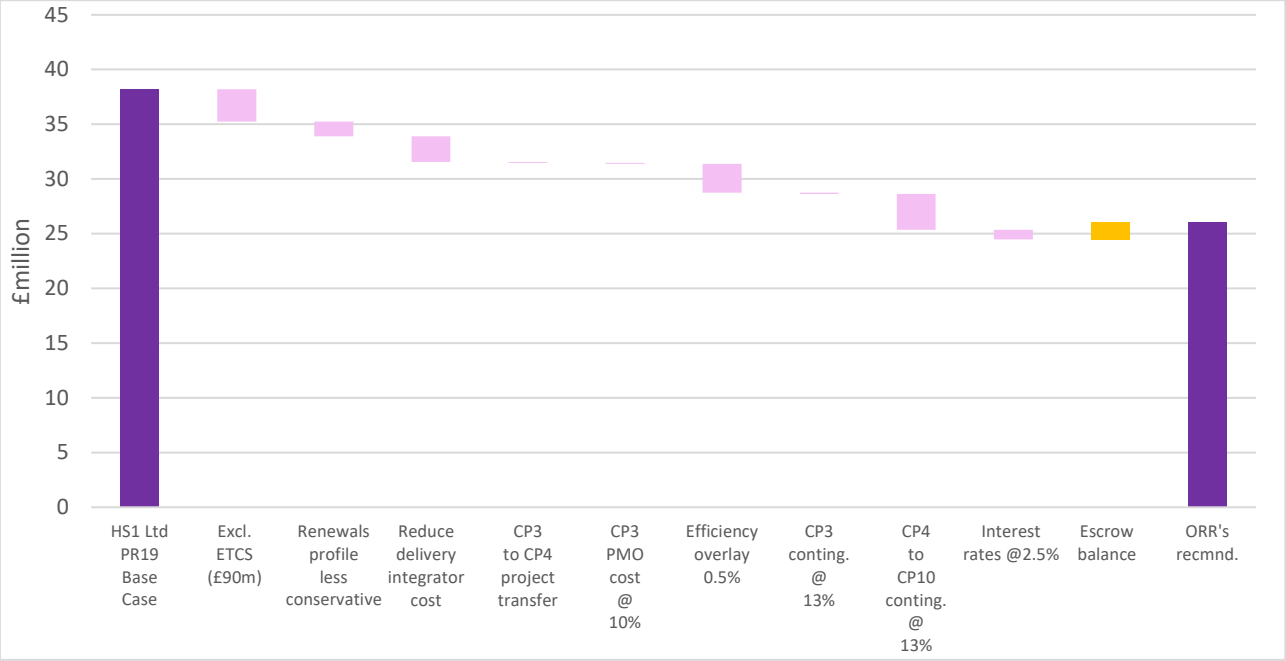
[33] Note the impact of our review of interest rates is included. This is covered in the next chapter (we recommend that the interest rate assumption on all balances should be 2.5% not 1.22% for Authorised investments and 0.70% for escrow balances).

[34] We note that converting our PR14 expected renewals annuities for CP3 and CP4 of £16.4 and £17.4m (both in 2012-13 prices) into 2018-19 prices would provide renewals annuities of approximately £18.9m in CP3 and £20.0m in CP4. Also, HS1 Ltd's initial PR24 proposal for the renewals annuity of £23.5m (2012-13 prices) is £27.0m in 2018-19 prices.

Chapter 3). Having a less conservative assumption would reduce the renewals annuity.

2.63. We have considered the impact of our recommended renewals annuity on operators in our assessment of charges (see our supplementary document setting out our charging and incentives draft findings). Based on the evidence provided to us at present we do not consider that there will be an undue impact on operators as a result of our recommendation. In reaching this recommendation, we have taken into account the requirements of the Concession Agreement and our Section 4 duties.

Figure 2.3 Impact of ORR proposed adjustments to HS1's final 5YAMS Base Case proposal (£m, February 2018 prices)[35]



Source: ORR analysis of HS1 Ltd's final 5YAMS.

[35] Note that the light pink coloured boxes show a decrease and the orange coloured box shows an increase.

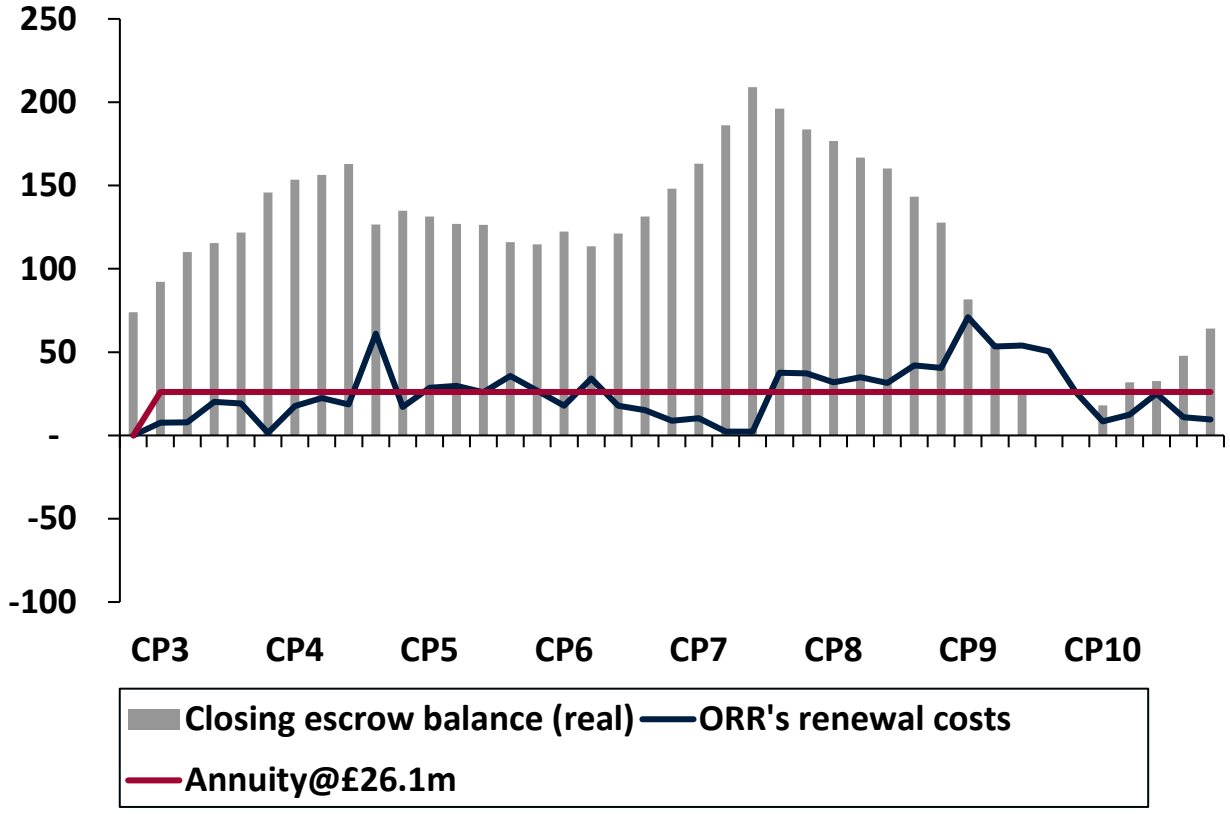
Table 2.6 Summary of ORR proposed adjustments and renewals annuity levels

Proposed adjustments	Renewals annuity impact (£m, Feb 2018 prices)	Renewals annuity levels (£m, Feb 2018 prices)
Excluding ETCS	-2.9	35.3
Total ORR renewals inputs views	-3.9	31.4
Efficiency overlay/frontier shift for CP4-10 of 0.5% per annum	-2.6	28.7
Risk and contingency for CP3-10 of 13%	-3.4	25.3
Interest rates of 2.5%[36]	-0.9	24.5
Escrow balance underfunding, no negative balances in CP9-10	+1.6	26.1

2.64. Figure 2.4 shows the resulting escrow balances from the renewals annuity set at £26.1m for each year over the 40-year forecast. At the end of CP10 the balance should be around £64m so provides sufficient funds to cover work that might extend beyond the 40-year forecast, i.e. it is a similar level to the amount of renewals that we think should move from CP4-CP10 to later control periods (£40m).

[36] This adjustment is based on a renewals annuity of £25.3m, i.e. the £28.7m renewals level referred to in Table 2.4 less the reductions for risk and contingency of £0.1m and £3.3m.

Figure 2.4 ORR proposed renewals annuity, renewals costs and closing escrow balances (£m)



2.65. In Table 2.7, we have shown the resulting escrow balances at the end of CP3, the end of CP6 (the end of the Concession Agreement) and the end of CP10. It is important when considering escrow balances to identify how many years of future renewals expenditure the balance covers. This allows us, HS1 Ltd and stakeholders to see what the effect of a cost shock or inaccurate forecast would be on future renewals annuities, so that the more years that are covered, the smaller the increase in the renewals annuity would need to be in the event of an increase in forecast renewals.

2.66. The table below shows the years covered at the end of CP3 and CP6. CP11 is not included in HS1 Ltd's final 5YAMS, so the years covered by the escrow balance at the end of CP10, are not shown below.

Table 2.7 Summary of escrow balances and the years covered[37]

Renewals Annuity options (£m, Feb 2018 prices)	End CP3 escrow balance	Number of years covered at end of CP3	End CP6 escrow balance[38]	Number of years covered at end of CP6	End CP10 escrow balance
HS1 Ltd Base Case (exc. ETCS)	143	3.7	179	5.7	0
HS1 Ltd '20-year' approach	93	3.0	132	4.7	n/a
HS1 Ltd 'Buffer' approach	88	2.8	35	2.0	0
ORR adjustments	146	5.3	148	6.8	64

Source: ORR analysis of HS1 Ltd's final 5YAMS.

2.67. In order to make sure there are no negative escrow balances in the future, we also need to enhance HS1 Ltd's reporting of renewal expenditure decisions. We consider this is the best approach to ensure HS1 Ltd is able to deliver its asset stewardship obligations.

[37] HS1 Ltd's Base Case, '20-year' approach and 'Buffer' approach have the same underlying renewals expenditure profile. The ORR recommendation has a lower renewals expenditure profile. The calculation of the number of years covered uses the renewals forecast for that approach. The same renewals expenditure forecast is not used on each line. We have not modelled the 'Ratchet' approach in this table because based on the information provided it is similar to the 'Buffer' and '20-year' approaches.

[38] The end of CP6 is also the end of the Concession Agreement.

3. Cost of capital, interest rates and inflation

Introduction

3.1. In this chapter, we consider the financial assumptions for the cost of capital, interest rates and inflation and how they impact on the renewals annuity.

3.2. In our PR14 determination, we said that we expected HS1 Ltd to forecast the cost of capital for future calculations. It has included a forecast in the final 5YAMS but has not provided sufficient evidence on how it was arrived at.

3.3. In PR19, the importance of the cost of capital for the renewals annuity calculation has been reduced as our modelling recognises that it is not efficient for the escrow account to be negative[39]. However, it is still important as it is taken into consideration in the assumptions for financing Specified Upgrades.

3.4. A key financial assumption used to calculate the renewals annuity and uplift track access charges is inflation and the index used to measure it.

3.5. The other financial inputs into the renewals annuity calculation are the interest rates on the escrow account balances, the proportion of money invested in Authorised Investments[40], and the returns from those investments over the 40-year period. The Concession Agreement allows up to 80%-90% of the escrow balance to be put in to Authorised Investments (which includes deposit accounts), leaving 10%-20% of the escrow balance in a current account.

Cost of capital

Introduction

3.6. Calculating the renewals annuity requires modelling escrow account balances in future control periods. If there are years when there are not sufficient funds in the escrow account to fund renewals, HS1 Ltd[41] would need to fund the expenditure itself. It will be compensated for the financing costs of this funding by the cost of capital assumption being applied to the funding required.

[39] In this document, we sometimes refer to a negative escrow balance for ease of reading. But the Concession Agreement does not permit withdrawals from the escrow account where this would leave a negative balance. If there was not enough money in the escrow account to fund future renewals work, HS1 Ltd would have to finance the work itself.

[40] The Concession Agreement defines Authorised Investments as certain deposit accounts and bonds which meet a particular credit rating.

[41] HS1 Ltd's parent company is Helix Acquisition Ltd.

3.7. The cost of capital is also relevant to investment recovery charge (IRC) calculations. This is because a cost of capital assumption is used in IRC calculations to recover the financing costs incurred in funding Specified Upgrades.

HS1 Ltd's position

3.8. HS1 Ltd has assumed a weighted average cost of capital (WACC) of 5.1% on a nominal vanilla basis[42]. The WACC has been calculated by HS1 Ltd for CP3 but applied by HS1 Ltd for negative escrow balances in CP9 and CP10 that occur after the Concession Agreement ends (end of CP6). HS1 Ltd has provided the information in Table 3.1 and stated that the 5.1% is a weighted average of these components. The real vanilla equivalent for HS1 Ltd is around 2.3% (using RPI at 2.75%).

Table 3.1 HS1 Ltd's estimate of its CP3 WACC

Category	Value (%)	Source
(A) Cost of equity	7.50	HS1 Ltd's shareholder estimate end March 2019
(B) Cost of debt	3.98	HS1 Ltd's estimate of actual cost of debt end March 2019
(C) Gearing	68.17	HS1 Ltd's estimate end March 2019
(D) Nominal vanilla WACC	5.10	**D = A * (1-C) + (B*C)**
Inflation	2.75	
Real vanilla WACC	2.30	

Source: HS1 Ltd.

Responses on cost of capital

3.9. Southeastern thought that the financing costs of negative balances should relate to HS1 Ltd's cost of debt.

Our draft findings on cost of capital

3.10. Across regulated companies the cost of capital varies. For example, we set Network Rail's cost of capital at 2.8% (real vanilla, with reference to RPI) in our latest review, Ofwat set a provisional 2.4% WACC (real vanilla) for water and sewerage companies

[42] The vanilla WACC is calculated using a pre-tax cost of debt and post-tax cost of equity, weighted by gearing.

in 2019, while Ofcom used an implied WACC (real vanilla) of 3.7% in 2018 for Openreach's copper access business[43].

3.11. The cost of capital affects the renewals annuity calculation in HS1 Ltd's modelling[44]. However, our recommended renewals annuity (based on our assumptions and proposed adjustments), means no negative balances are forecast for the 40-year time period.

3.12. HS1 Ltd used its own WACC in its final 5YAMS and in further correspondence explained that the 5.1% represents the WACC used by its shareholder.

3.13. Based on the information available to us at this time, we do not consider that there is sufficient evidence and analysis provided by HS1 Ltd to demonstrate that 5.1% represents a reasonable estimate of the WACC to be used for PR19. We have asked it to provide further justification. Although we note that the 5.1% assumption is similar to some of the WACCs set by other regulators, after converting it to real prices (2.3% in real prices).

3.14. As part of PR19, we are recommending ETCS should be treated as a Specified Upgrade. This is because ETCS is a major upgrade of the signalling system on HS1 Ltd's infrastructure (estimated at £90m in CP5)[45]. This means that the WACC assumption will be more important in future reviews and we would expect HS1 Ltd to provide a comprehensive WACC analysis as part of its PR24 submission.

3.15. The WACC assumption used in previous control periods and proposed by HS1 Ltd for CP3 is the general WACC of the company. However, given the materiality of the ETCS project we would need to consider the specific circumstances of the project and the risks involved. For example, how HS1 Ltd is intending to finance the project and whether it has an efficient capital structure.

3.16. We expect HS1 Ltd in due course to propose how it will determine the WACC for Specified Upgrades, such as ETCS, which we will consider in reaching our opinion of whether HS1 Ltd's submission is reasonable. This process will include consideration of the appropriate cost of capital.

[43] UKRN Cost of Capital Annual Update June 2018 report

[44] It is important to note that the renewals annuity is not a present value calculation, so the cost of capital does not play a discount rate role.

[45] So far in the concession the only Specified Upgrade is the GSM-R project (valued at approximately £6m).

Interest rates

Introduction

3.17. Interest rate assumptions effect the calculation of the renewals annuity because they are used to calculate the return on forecast Authorised Investments and the balances in the escrow account.

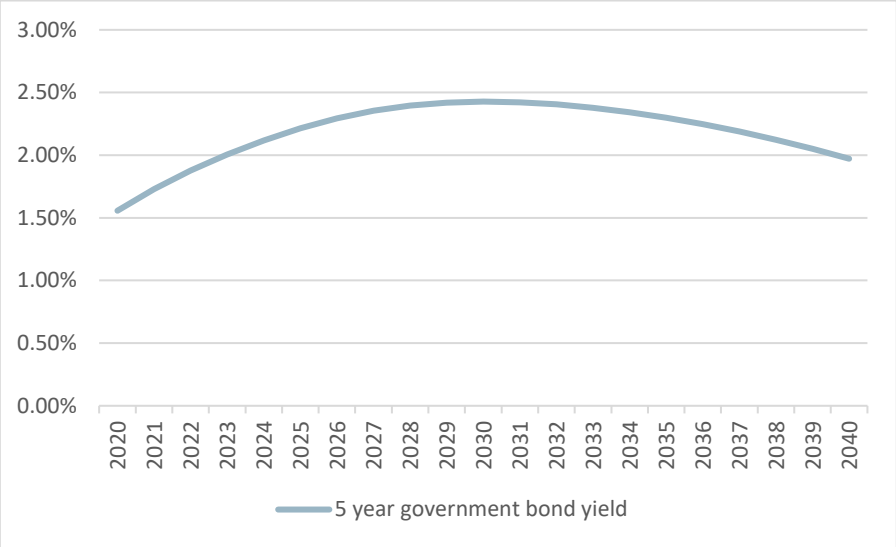
HS1 Ltd's position

3.18. In its final 5YAMS, HS1 Ltd assumed that on average 80% of the escrow balance would be in Authorised Investments and 20% would be in the escrow account. HS1 Ltd used the following interest rate assumptions (in nominal prices[46]) for its renewals annuity calculations:

- 1.22% for Authorised Investments; and
- 0.70% for funds remaining in the escrow account.

3.19. HS1 Ltd's renewals annuity model includes a forward curve for five-year government bonds as shown in Figure 3.1[47]. But it has not been used in the calculation of the renewals annuity by HS1 Ltd.

Figure 3.1 Forward curve for five-year government bond yields



Source: Analysis by Oxera for HS1 Ltd's final 5YAMS.

[46] When we refer to interest rates in this document they are always in nominal prices.

[47] The source for this is HS1 Ltd's calculations in its renewals annuity calculation model submitted as part of its final 5YAMS.

ORR's assessment of interest rates

3.20. Based on the market information embedded in the forward curve, a 1.22% interest rate for Authorised Investments appears too conservative. Currently, the market is already expecting a gradual increase on five-year government bond yields over the next ten years to a level of approximately 2.5%.

3.21. The average five-year government bond yield over CP3 is 1.9% based on HS1 Ltd's forward curve. Similarly, the average five-year government bond yield over the remainder of the Concession Agreement term (20 years) is 2.2%. We consider an assumption of 2.1% is reasonable to use as a risk-free interest rate assumption for the purpose of the renewals annuity calculation.

3.22. We have used a five-year government bond as the starting point of our analysis because the implied forward curve reflects a reasonable assumption of the forward looking risk-free rate[48].

3.23. HS1 Ltd's renewals annuity model also provides five-year estimates of historical spreads between government bond yields and gilts for AAA-rated corporate bonds. HS1 Ltd's calculations show an historical average uplift of approximately 70 basis points on gilts for AAA-rated corporate bonds compared to government yields. This is because of the higher risk premium that investors require to invest in corporate bonds, as opposed to government bonds, to compensate for greater risk of credit default.

3.24. Putting together our view of the risk-free rate and the historical spread analysis results in an interest rate assumption of 2.8% for investments in AAA-rated corporate bonds for the next 20 years. However, we are aware that HS1 Ltd will not place all of the funds in bonds, as some will be on deposit and some will be in the escrow account. So, taking account of this, we have assumed an average interest rate of 2.5% and applied that to the total balances.

3.25. Given the uncertainty in interest rates and the difficulty of accurately forecasting interest rates over a 40-year period, we have used our assumption for the next 20 years for the whole 40-year period[49]. However, we are conscious that our interest rates forecast is likely to be conservative, especially in 20 years' time because interest rates are historically low at present.

[48] Shorter government bond maturities are likely to be too influenced by shorter term economic conditions and longer-term maturities will include less reliable market expectations.

[49] For this reason, we also do not consider it necessary to use a specific interest rate for each year.

Responses on interest rates

3.26. Some passenger operators requested confirmation that the most up to date interest rate forecasts were used. Passenger operators have also highlighted the relatively low forecast returns on Authorised Investments and the escrow account[50].

Our draft findings on interest rates

3.27. There should be opportunities over the short, medium and longer term to make Authorised Investments in government and corporate bonds, which should provide a greater yield compared to investing in deposit accounts. To more fully address operators concerns over potential returns would require the Concession Agreement to be amended[51].

3.28. Having reviewed the information that HS1 Ltd submitted to us, and taking account of the uncertainty in interest rates and the difficulty of accurately forecasting interest rates over a 40-year period, we consider that a 2.5% interest rate is an appropriate forward-looking assumption to use for the purposes of the renewals annuity calculation. So, we recommend that HS1 Ltd further considers its interest rate assumptions.

3.29. In choosing 2.5%, we recognise that not all Authorised Investments will be in bonds, i.e. a proportion will be in deposit accounts and in the escrow account. We expect this rate to be reflected in HS1 Ltd's revised final 5YAMS.

3.30. We note that the interest rate assumptions could be higher in the future if changes are made to the Concession Agreement that would allow greater flexibility to invest the funds in the escrow account. If in 20 years' time interest rates are still as low as they are now, there could be an issue of whether an escrow funding method is appropriate going forward.

Inflation

Introduction

3.31. The choice of inflation price index is relevant to our determination for two key reasons:

(a) in our modelling of the renewals annuity, to forecast and apply inflation on renewals costs over the 40-year renewal periods. This informs the uplift to the

[50] Passenger operators considered HS1 Ltd could earn a higher return on the funds.

[51] The process around Authorised Investments is set out in Appendix 1 of Schedule 10 to the Concession Agreement.

renewals annuity from the price base used by HS1 Ltd in its final 5YAMS to the price base used in its actual track access charges; and

(b) to uplift track access charges from the price base used by HS1 Ltd in its final 5YAMS to the price base used in its actual track access charges.

3.32. It is important that the inflation price index used is the same for these two purposes. This is because there is an intrinsic link between the annual rate of general inflation and the uplift that should be applied to the renewals annuity and track access charges.

3.33. In CP1 and CP2, the retail price index (RPI) was used for these purposes. In our Approach to PR19[52], we mentioned that we would consider whether HS1 Ltd should use the Consumer Price Index (CPI). This is because CPI is a more robust measure of economy-wide price inflation. Many regulators (including ORR in relation to Network Rail Infrastructure Limited[53]) are already using CPI to account for inflation in other regulated services.

HS1 Ltd position on inflation

3.34. In its final 5YAMS, HS1 Ltd considered that the use of RPI should continue to the end of the Concession Agreement[54] and that a change to CPI could be left to the development of a new concession agreement. HS1 Ltd also noted that:

(a) the IRC is unregulated and is indexed by RPI under the terms of the Concession Agreement;

(b) regulated passenger train fares are also indexed to RPI; and

(c) contracts that support the Concession Agreement use RPI as the inflation basis. For example, under the terms of the Operator Agreement with NR(HS), the Annual Fixed Price is linked to RPI and HS1 Ltd cannot change this in CP3.

3.35. In its final 5YAMS, HS1 Ltd also set out its inflation forecast of 2.75%[55]. The basis of this number is the 2.00% CPI Bank of England forecast, plus an additional 75 basis points to bring it into line with RPI. This number is used in the renewals annuity calculations.

[52] ORR Approach to PR19, published January 2018

[53] ORR periodic review of Network Rail Infrastructure Limited 2018 final determination, page 111.

[54] HS1 Ltd final 5YAMS, July 2019, section 13.5.

[55] HS1 Ltd final 5YAMS, page 53.

Responses on inflation

3.36. There were no comments on the choice of the inflation index, or the actual RPI forecast. However, we note that EIL used an assumption of 2.00% in its 'Ratchet' approach.

Our assessment of forecast inflation

3.37. The 2019 August Bank of England inflation report[56] forecasts out to Quarter 3 of 2022. Based on the CPI projections that appear in Chart 5.3 of that report, a 2.00% CPI inflation rate appears in line with, but on the downside of, a reasonable forward-looking estimate.

3.38. Our own analysis of the historical differences between RPI and CPI shows a difference of 73 basis points for one year of historical data and 93 basis points if five years' worth of historical data are used instead[57]. As a result, in our view applying a 75 basis point uplift to CPI is a reasonable way of producing a forward-looking RPI estimate from CPI.

3.39. Given the difficulty of accurately forecasting inflation over a five-year period, and because any forecasting errors within the HS1 Ltd inflation assumptions will be corrected by the annual inflation wash-up[58], we do not consider any changes to HS1 Ltd's inflation assumption are needed.

Our draft findings on inflation

3.40. For the reasons set out above, we do not intend to consider the use of CPI further for CP3 as making changes in some areas but not others could cause confusion. In particular, we are mindful that the link to the 1.1% input price adjustment is built into the Concession Agreement, which is referenced to RPI.

3.41. So, we are minded to accept that HS1 Ltd will continue to use RPI for CP3 at the 2.75% level it suggested.

3.42. We note that the EIL 2.00% assumption is similar to CPI and do not think this proposal is appropriate as the use of RPI is set out in the Concession Agreement, which also covers the issue of input price inflation.

[56] Bank of England Monetary Policy Committee Report on Inflation, August 2019

[57] Source: Office of National Statistics inflation and price indices website

[58] This adjusts the renewals annuity and track access charges for the actual inflation outturn.

4. HS1 Ltd subcontract, internal, pass-through and freight-specific costs

Introduction

4.1. The final 5YAMS separates HS1 Ltd's own costs into subcontract costs (excluding the NR(HS) contract) and internal costs. These costs are recovered through the OMRCs. It also charges for pass-through costs and freight-specific costs. The costs include the following categories:

(a) HS1 Ltd subcontract costs:

(i) Network Rail other - these are primarily costs incurred in relation to the interface assets between the Network Rail Infrastructure Limited and HS1 Ltd's networks, and the costs of additional services required on the route over and above services covered by the Operator Agreement;

(ii) GSM-R - costs relating to the HS1 Ltd owned Global System for Mobile Communications – Railway ('GSM-R') equipment and a percentage of the national Network Rail Infrastructure Limited spine network;

(iii) National Grid connection fees - charges for connecting HS1 Ltd/UK Power Network Services (UKPNS) assets to the National Grid;

(iv) British Transport Police ('BTP') - costs relating to the work of BTP on HS1 Ltd's network; and

(v) ORR regulatory and safety - costs relating to the work of ORR in regulating HS1 Ltd.

(b) HS1 Ltd's internal costs:

(i) staff - cost of HS1 Ltd's staff;

(ii) technical/legal support - consultancy costs of technical, procurement, projects (for example electricity studies) and legal work etc; and

(iii) office running costs - predominantly rent and IT/telecoms.

(c) Pass-through costs include:

(i) non-traction electricity;

(ii) UKPNS operations, maintenance and renewals costs for the provision of traction electricity;

(iii) traction electricity

(iv) insurance; and

(v) business rates.

(d) Freight-specific costs include:

(i) operating and maintenance costs allocated to freight;

(ii) Ripple Lane exchange siding costs; and

(iii) HS1 Ltd's costs allocated to freight.

CP2 experience and HS1 Ltd's assessment for CP3

4.2. In its final 5YAMS, HS1 Ltd reported that for CP2, its internal costs and pass-through costs were higher than the efficient budget[59], as shown in Table 4.1. The main variances were in pass-through costs (£6.3m higher) and HS1 Ltd costs (£4.3m higher). HS1 Ltd's costs were higher because its internal costs were £7.9m higher, even though its subcontracting costs were £3.6m lower.

4.3. Table 4.1 presents the overall operating and maintenance costs for CP2. Although this chapter focuses on HS1 Ltd's subcontract, internal, pass-through and freight-specific costs it is also useful to show the NR(HS) costs for context.

[59] 'Efficient budget' was used in HS1 Ltd's final 5YAMS to describe the budget set out at the start of CP2 and agreed with ORR.

Table 4.1 CP2 Summary of operating and maintenance costs

£m, Feb 2018 prices	Efficient budget	Actual/Forecast	Variance	% Variance
NR(HS)	212.9	212.9	0.0	0%
HS1 subtotal	**61.3**	**65.6**	**+4.3**	**+7%**
- HS1 subcontract	22.8	19.2	-3.6	-16%
- HS1 internal	38.5	46.3	+7.9	+21%
Pass-through	79.1	85.4	+6.3	+8%
Freight-specific	2.9	2.9	0.0	0%
Total operating and maintenance costs	**356.2**	**366.8**	**+10.6**	**+3%**

Source: Table 8 and 12 in HS1 Ltd's final 5YAMS.

4.4. In Table 4.2, we summarise HS1 Ltd's proposal for CP3 and compare it with the CP2 forecast outturn (note a comparison with the efficient budget produces different results). NR(HS) costs are forecast to reduce by £7.4m from CP2 to CP3, which is explained in our asset management document.

4.5. HS1 Ltd's subcontract and internal costs are forecast to be £59.9m in CP3, which is £5.7m lower than the forecast outturn for CP2. They represent approximately 17% of total operating and maintenance costs at £362.6m[60].

4.6. The pass-through costs for CP3 in HS1 Ltd's final 5YAMS are £95.4m (26% of total operating and maintenance costs). They are £10.0m higher than the forecast outturn for CP2.

4.7. Freight-specific costs include NR(HS) operations and maintenance costs attributable to freight; costs for Ripple Lane and HS1 Ltd specific freight costs. Overall there are reductions of £0.2m on a CP3 exit vs CP2[61] exit basis (final year comparisons), and £1.1m comparing the totals for CP3 and CP2 (shown in Table 4.2). The main reduction comes from lower freight NR(HS) costs, as HS1 Ltd and Ripple Lane costs are similar to the CP2 forecast.

[60] HS1 Ltd final 5YAMS, July 2019, Table 37.

[61] HS1 Ltd final 5YAMS, July 2019, Table 8 and Table 49.

Table 4.2 Summary of HS1 Ltd's CP3 operating and maintenance costs

£m, Feb 2018 prices	CP3 Total	Difference CP3 vs CP2 forecast	% variance
NR(HS) costs	205.5	-7.4	-3.5%
HS1 Ltd costs	**59.9**	**-5.7**	**-8.7%**
- subcontract	18.7	-0.5	-2.6%
- internal	41.2	-5.1	-11.0%
Pass-through costs	95.4	10.0	11.7%
Freight-specific costs	1.8	-1.1	-37.9%
Total	**362.6**	**-4.2**	**-1.1%**

Source: Tables 8, 12 & 37 in HS1 Ltd's final 5YAMS and ORR calculations.

HS1 Ltd's subcontract costs

4.8. HS1 Ltd expects its CP3 exit subcontract costs to reduce by £0.2m compared with the CP2 exit and for CP3 in total to be £0.5m lower than its CP2 forecast outturn (see Tables 4.2 and 4.3). This is because:

(a) Network Rail costs are flat on a CP3 exit vs CP2 exit basis but CP3 overall is forecast to be £0.4m higher than CP2;

(b) the Network Rail GSM-R costs have reduced by £0.3m per year through their inclusion in an annual fixed price contract. This is the main reduction in HS1 Ltd subcontract costs for CP3. In total the costs will be £1.3m lower in CP3 than in CP2;

(c) National Grid connection fees are £0.1 lower in total for CP3 compared to CP2, while CP3 BTP costs are estimated to be the same as in CP2 on an exit vs exit basis and for the control periods in total; and

(d) ORR regulatory and safety costs are forecast to be £0.1m higher (on a CP3 to CP2 exit basis) leading to a £0.6m increase in CP3.

4.9. HS1 Ltd states that further work is on-going to determine whether Network Rail and BTP costs can be reduced.

Table 4.3 CP3 Summary of HS1 Ltd's subcontract costs

£m, Feb 2018 prices	CP3 Total	Difference CP3 vs CP2 forecast	% variance
NR Costs	7.8	0.4	5.4%
NR GSM-R	1.4	-1.3	-48.1%
NGC connection fees	2.4	-0.1	-4.0%
BTPA	5.1	0.0	0.0%
ORR regulatory & safety	2.0	0.6	42.9%
Total	**18.7**	**-0.5**	**-2.6%**

Source: Tables 12 & 44 in HS1 Ltd's final 5YAMS and ORR calculations.

HS1 Ltd's internal costs

4.10. Internal costs for HS1 Ltd are expected to reduce on a CP3 exit vs CP2 exit basis and when comparing the CP3 estimate with the CP2 forecast outturn (see Table 4.4). This is because:

(a) staff costs are constant on a CP3 exit vs CP2 exit basis but have increased by £1.1m between CP2 and CP3 largely because of restructuring and expanding capability;

(b) there is a forecast reduction in technical support/consultancy costs of £4.4m between CP2 and CP3 (£1.4m on a CP3 exit vs CP2 exit basis) linked to HS1 Ltd's carrying out more work in-house;

(c) office costs are expected to be £0.2m higher in CP3 on a CP3 exit vs CP2 exit basis but broadly similar when comparing control periods. This is a result of a forecast rent increase being offset by efficiencies;

(d) 'Other: Concession' costs are forecast to be similar on a CP3 exit vs CP2 exit basis but are forecast to be £0.3m higher in CP3 than in CP2 because year 1 of CP2 was low; and

(e) 'Other: Railway' costs are forecast to be £0.5m lower per annum on a CP3 exit vs CP2 exit basis. The total CP3 forecast is £2.0m lower than in CP2. The re-categorisation of £0.5m per annum to UKPNS operations and maintenance costs (in pass-through costs) partially explains the change. However, the rest of the variance has not yet been explained.

4.11. HS1 Ltd stated in its final 5YAMs that UKPNS additional costs will be passed to operators with the effect of reducing HS1 Ltd internal costs. HS1 Ltd has now said that this will not happen, which will mean that its internal costs will increase by £0.5m and pass-through costs will reduce by the same amount. We expect HS1 Ltd to clarify this updated position in its revised final 5YAMS.

Table 4.4 CP3 Summary of HS1 Ltd's internal costs

£m, Feb 2018 prices	CP3 Total	Difference CP3 vs CP2 forecast	% variance
Staff	22.8	1.1	5.1%
Technical Support/consultancy	5.2	-4.4	-45.8%
Office	5.7	0.0	0%
Other: Concession	4.9	0.3	6.5%
Other: Railway	2.7	-2.0	-42.6%
Total	**41.2**	**-5.1**	**-11.0%**

Source: Tables 12 & 44 in HS1 Ltd's final 5YAMS and ORR calculations.

Pass-through costs (excluding traction electricity)

4.12. The estimate of pass-through costs is provided so that they can be included in the calculation of track access charges for operators. They are indicative and an adjustment is made during the annual 'wash-up' process to ensure operators are only charged for efficient expenditure that is incurred.

4.13. Table 4.5, shows HS1 Ltd's final 5YAMS pass-through costs are expected to be £10.0m higher than in CP2. This is largely because of the increase in business rates following a 2017 business rates revaluation (from £5.3m to £8.4m per annum). This was a 58% increase that took place in two stages[62]. The UKPNS costs as presented in the final 5YAMS, also show an increase reflecting additional engineers and a re-categorisation of costs.

[62] The business rates revaluation used the standard method of assessing business rates for the first time (using a receipts and payments methodology to determine the valuation).

Table 4.5 CP3 Summary of pass-through costs (excluding traction electricity)

£m, Feb 2018 prices	Total	Difference CP3 vs CP2 forecast	% variance
Non-traction electricity	9.0	1.2	+15.4
Insurance	15.0	-1.0	-6.3
UKPNS Operations, Maintenance and renewals	29.2	2.4	+9.0
Business rates	42.2	7.4	+21.3
Total	**95.4**	**10.0**	**+11.7**

Source: Tables 16 & 47 in HS1 Ltd's final 5YAMS and ORR calculations.

4.14. HS1 Ltd has forecast that in CP3, business rates are expected to remain at CP2 exit levels (£8.4m per annum). The total cost of £42.2m for CP3 is £7.4m higher than the CP2 forecast outturn and £16.1m higher than the CP2 efficient budget. HS1 Ltd has also stated that there could be two further business rate revaluations in CP3.

4.15. HS1 Ltd has said that the re-categorisation of £0.5m of HS1 Ltd internal costs to the UKPNS operations and maintenance cost category (in pass-through costs) will now not take place. We expect HS1 Ltd to clarify this updated position in its revised final 5YAMS. In particular, whether pass-through costs will now reduce by £0.5m and HS1 Ltd's internal costs will increase by the same amount.

4.16. The CP3 insurance costs show a £1.0m reduction compared with CP2. This is because in 2018 HS1 Ltd entered into a three-year insurance deal which delivered savings. So, in 2018-19 insurance costs were £2.9m, down from £3.2m in the previous year.

4.17. HS1 Ltd indicated that it would recover the costs of market testing the Operator Agreement through pass-through costs. However, because HS1 Ltd has not yet made a decision about any such market test, it decided that it was not appropriate to include an estimate in its final 5YAMS. It has proposed contractual amendments that will permit any costs associated with market testing the Operator Agreement to be passed through to operators.

Traction electricity

4.18. Traction electricity accounts for approximately 20% of train operators' costs. It is charged separately to operators as a pass-through cost based on usage. The total CP3 traction electricity cost is £101.2m compared to £88.1m in CP2. In the first year

of CP3, traction electricity is expected to cost £20.8m, reducing over the control period to £20.0m in the last year. The CP3 exit vs CP2 comparison shows a reduction of £0.2m.

4.19. HS1 Ltd has reviewed its approach to energy use, commissioning UKPNS and SNC-Lavalin to examine system usage. The work concluded that there were not viable cost reduction options at present for system usage but infrastructure enhancements may reduce energy demand. HS1 Ltd has said it is open to working with operators on infrastructure, metering and contracts.

Responses on pass-through costs (including traction electricity)

4.20. EIL pointed out that pass-through costs are flat or slightly rising and that this denotes a lack of drive to work on behalf of customers.

4.21. Passenger operators expressed the desire for HS1 Ltd to look at more efficient energy use and metered billing.

4.22. The Rail Freight Group and Deutsche Bahn Cargo, known as DB Cargo, both highlighted that they thought Ripple Lane should be owned by Network Rail Infrastructure Limited and then removed from HS1 Ltd's charging structure.

Our draft findings on HS1 Ltd's subcontract, internal, pass-through costs and freight specific costs

4.23. For HS1 Ltd's subcontract costs, we consider HS1 Ltd's commissioning of Vertex, to undertake a technical review of its Operation and Maintenance Agreement (OMA)[63] to consider how further efficiencies can be delivered for costs, was a positive step, assuming any efficiency improvements identified are implemented. The reductions in GSM-R and National Grid connection fees for subcontract costs represent improvements over CP2.

4.24. HS1 Ltd's own internal costs increased by £4.3m in CP2, so we expect its own cost forecasting to be more accurate for CP3 and we think that it should be better placed in the future to challenge NR(HS)'s costs. Also, HS1 Ltd needs to provide further clarification for the movements in 'Other: Concession' and 'Other: Railway' costs.

4.25. As we indicated in our asset management document, we have not set an explicit efficiency challenge for HS1 Ltd's internal costs. Rather we expect it to be more efficient by undertaking a more proactive role around challenging efficiency in

[63] The OMA governs interface assets between Network Rail Infrastructure Limited and HS1 Ltd.

NR(HS), its own costs and on pass-through costs, so effectively doing “more with the same”.

4.26. HS1 Ltd acknowledges that there could be two business rates revaluations during the CP3 period, now that the valuations take place every three years instead of five, but has assumed no increases in CP3. This could be optimistic, especially as we note that Network Rail Infrastructure Limited has factored in one 38% increase during the next five years[64]. So, we will discuss this assumption further with HS1 Ltd before the final determination.

4.27. We think that the RPI-linked UKPNS contract which runs to 2057, should continue to be reviewed for efficiencies and HS1 Ltd should continue to work with stakeholders in CP3 to test the viability of options to reduce costs.

4.28. For insurance, the requirements on HS1 Ltd are largely set out in the concession agreement. HS1 Ltd has included an additional £0.1m per annum compared with the CP2 exit in its forecast from 2020-21 for a property revaluation. The current insurance deal allows for 20% revaluation increases (i.e. the costs will not change if properties are revalued by up to an additional 20%). It is not clear if this has been taken into account in the additional £0.1m.

4.29. As the costs of market testing the Operator Agreement are uncertain it may be a reasonable approach for the efficient costs of this process to be treated as pass-through costs.

4.30. HS1 Ltd’s final 5YAMS explains that in CP2, freight-specific costs for NR(HS) reduced due to reduced train activity and revised mothballing costs. It then explains that NR(HS) freight-specific costs for CP3 are based on the number of trains, train weights and equivalent track-km. The lower NR(HS) costs in CP3 are not explained beyond that, so further clarity on the reduction is necessary. We note that freight customers and HS1 Ltd agree that the costs of Ripple Lane should be directly charged by Network Rail Infrastructure Limited (which manages the facility) to operators and we have asked Network Rail Infrastructure Limited for its view on the issue.

4.31. Overall, we consider HS1 Ltd’s subcontract, internal, pass-through (including traction electricity) and freight-specific costs to be reasonable and therefore our draft conclusion is that, in respect of these costs, the final 5YAMS is consistent with HS1 Ltd’s General Duty.

[64] This follows a one-off 35% increase in the 2017 revaluation.

5. Monitoring, reporting and outperformance

Introduction

5.1. In our Approach to PR19 document[65] we said that we would consider:

(a) the allocation and management of risk;

(b) the framework for the escrow account, including issues relating to the profiling of payments by operators; and

(c) our approach to measuring and monitoring HS1 Ltd's efficiency, and the interface with asset management and performance.

5.2. Responses to our Approach document demonstrated that operators and HS1 Ltd have differing views on who bears the risks relating to renewals (HS1 Ltd thinks operators bear the risk through the escrow account). Responses to the Approach document also included similar concerns to those expressed earlier in this document on the returns from escrow account investments.

5.3. In addition to this, it was recognised that further clarity on what the Concession Agreement defines as "efficient spend" could be helpful, and improvements to reporting and monitoring of HS1 Ltd performance based on ORR's approach with Network Rail Infrastructure Limited, could be considered.

5.4. We also raised the issues of risk and incentives in our July 2019 Escrow discussion document.

5.5. We publish an annual report on HS1 Ltd 's performance[66] which assesses:

(a) train service performance and traffic volume;

(b) asset management;

(c) finance and efficiency; and

(d) health and safety.

5.6. In our latest report for 2018-19, we recognised that HS1 Ltd has maintained a high level of train service reliability (significantly above the minimum standard required from the Concession Agreement). However from a financial perspective it

[65] ORR Approach to PR19, published January 2018

[66] ORR's annual report on HS1 Ltd's performance in 2018-2019, published July 2019

underperformed, overspending compared to its assumed costs from PR14. The overspend was nearly offset by increases in its regulated income.

5.7. In 2012, HS1 Ltd renegotiated the Operator Agreement with NR(HS), including an outperformance framework for operations and maintenance[67], whereby operators will receive 30%, NR(HS) 50%, and HS1 Ltd 20%, of any outperformance in the last three years of CP2 and CP3. HS1 Ltd and NR(HS) have told us that no outperformance was payable for the two applicable years so far (1 April 2017 – 31 March 2018 and 1 April 2018 – 31 March 2019). HS1 Ltd is still in discussions with NR(HS) to confirm that this is the case for the year ending in March 2019.

5.8. In addition to this, the Concession Agreement contains an outperformance mechanism for sharing renewals efficiencies. Outperformance on renewals can be assigned 70% towards future renewals (that is, retained in the escrow account) and 30% to HS1 Ltd. As part of a periodic review, we must review these percentages.

5.9. Whether any payments arise in accordance with this mechanism, is dependent on us determining that HS1 Ltd outperformed against plans set out in its 5YAMS (in this case the approved PR14 final 5YAMS) and the escrow account balance being at the level necessary for HS1 Ltd to comply with its General Duty, with respect to renewals.

5.10. In its final 5YAMS, HS1 Ltd did not identify any renewals outperformance from CP2 for us to consider. In addition, the escrow balance is not at the level we think is adequate (as we explained in Chapter 2, we consider the escrow account to be underfunded). As a result, there is no sharing of efficiencies to be applied in our draft determination.

Our proposals

5.11. In light of our assessment of HS1 Ltd's final 5YAMS and the increase in expenditure in CP3, we think that it is necessary to strengthen monitoring and reporting on its cost base, risk and contingency, escrow balance performance and efficiency. We could do this by adopting some of the tools we have used for Network Rail Infrastructure Limited, for example in depth commentary on HS1 Ltd's efficiency initiatives in CP3. This should strengthen the incentives surrounding the financial framework and encourage greater ownership of risk and contingency and delivery by HS1 Ltd.

5.12. Our assessment of renewals costs demonstrates the importance of us enhancing HS1 Ltd's reporting of renewals expenditure. This will provide better information and

[67] This is consistent with the terms of the Concession Agreement, whereby HS1 Ltd is permitted to retain any savings achieved in respect of operating and maintenance expenditure at the end of a control period, to apply as it determines.

reputational incentives on HS1 Ltd and its partners to improve forecasting, provide more robust efficiency plans, help to avoid negative escrow account balances and use escrow funds efficiently. In our view this is the best approach to help HS1 Ltd to deliver its asset stewardship obligations and will help stakeholders and ORR to assess how well HS1 Ltd is driving efficiency and proactively managing risk and contingency.

5.13. In the future, it is possible that there may be situations where outperformance of operations, maintenance and renewals could lead to the sharing of efficiencies. Establishing stronger monitoring and reporting during CP3 will support the process and transparency for both of these mechanisms.

5.14. In isolation, we consider that the percentage shares in the renewals outperformance mechanism are broadly consistent with other similar mechanisms and can provide a reasonable way of sharing outperformance. So, we are not proposing to change them in PR19. But given the way financial risk is dealt with in the Concession Agreement, and the incentive issues we have identified in this document and in our Escrow discussion document, we think that in the future we will consider how the incentive works with the other incentives on HS1 Ltd.

6. Expenditure summary

6.1. In this chapter, we provide our PR19 expenditure assumptions, which are the basis for the indicative charges included in our draft determination.

6.2. The starting point for charging is the expenditure incurred for operating, maintenance and renewals expenditure shown in Table 6.1. The OMRCs include payment of: HS1 Ltd costs (line 3 in Table 6.1), the NR(HS) Annual Fixed Price contract (line 11)[68], pass-through costs (line 12) and freight-specific costs (line 13). Line 14 is the forecast renewals costs, as explained in the asset management supplementary document and Chapters 1 and 2.

6.3. All freight-specific costs are included in line 13. As well as the freight-specific operating and maintenance costs, they include costs incurred for Ripple Lane and dedicated HS1 Ltd resource.

6.4. Traction electricity costs (line 16) are recovered separately through a separate charge.

6.5. Table 6.2 shows how the forecast expenditure is converted into the expenditure that is used to calculate charges for HS1 Ltd. The main adjustment is the inclusion of the renewals annuity instead of the renewals costs.

[68] An Operator Agreement uplift of 1.1% for input price inflation ('escalation' (line 9)) is added to the Annual Fixed Price contract paid to NR(HS) to arrive at the total NR(HS) cost (line 11). There is also an adjustment on line 10 to assign freight-specific operating and maintenance costs to passengers and freight operators.

Table 6.1 ORR assessed total HS1 Ltd expenditure for CP3

£m, February 2018 prices	2020-21	2021-22	2022-23	2023-24	2024-25	CP3 Total	Reference
HS1 Ltd							
(1) HS1 Subcontract costs	3.7	3.7	3.8	3.8	3.8	18.7	Chapter 4
(2) HS1 Internal costs	7.9	8.2	8.6	8.5	8.0	41.2	Chapter 4
(3) Total HS1 Ltd costs	**11.6**	**11.9**	**12.4**	**12.3**	**11.8**	**59.9**	
NR(HS)							See source note
(4) Total operating and maintenance costs	37.0	36.9	36.2	36.0	35.4	181.5	
(5) Management fee	3.0	3.0	2.9	2.9	2.8	14.5	
(6) Contract risk premium	1.6	1.6	1.6	1.6	1.5	7.9	
(7) Outperformance	-	-	-	-	-	-	
(8) NR(HS) (Annual Fixed Price)	**41.6**	**41.5**	**40.7**	**40.4**	**39.7**	**203.9**	
(9) Escalation (1.1% uplift)	0.5	0.5	0.4	0.4	0.4	2.2	
(10) Freight-specific operating and maintenance costs[69]	-0.1	-0.1	-0.1	-0.1	-0.1	-0.7	
(11) Total NR(HS)	**41.9**	**41.8**	**41.0**	**40.8**	**40.0**	**205.5**	
Other Costs							
(12) Pass-through	19.1	19.1	19.1	19.1	19.1	95.4	Chapter 4
(13) Freight-specific	0.4	0.3	0.4	0.4	0.4	1.8	Chapter 4
(14) Renewals costs	9.3	12.6	18.0	17.3	10.8	67.9	Chapter 1,2 & 3
(15) Total OM&R Costs	**82.4**	**85.8**	**91.0**	**89.9**	**82.1**	**430.4**	
(16) Traction electricity	20.8	20.2	20.1	20.1	20	101.2	Chapter 4
(17) Total costs	**103.2**	**106.0**	**111.1**	**110.0**	**102.1**	**531.6**	

Source: HS1 Ltd's final 5YAMS, ORR analysis and our asset management document.

[69] The freight-specific element is deducted from the NR(HS) costs to avoid double counting as it is included in the other costs freight-specific total.

Table 6.2 CP3 expenditure funded by charges

(£m, February 2018 prices)	2020-21	2021-22	2022-23	2023-24	2024-25	CP3 Total	Reference
Total costs (Line 17 in Table 6.1)	**103.2**	**106.0**	**111.1**	**110.0**	**102.1**	**531.6**	**Table 6.1**
Less: Renewals costs (Line 14 in Table 6.1)	9.3	12.6	18.0	17.3	10.8	67.9	Table 6.1
Add: Renewals annuity	26.1	26.1	26.1	26.1	26.1	130.5	Chapter 2
Total costs funded by charges	**120.0**	**119.5**	**119.2**	**118.8**	**117.4**	**594.2**	

7. Our draft conclusions

7.1. We think that the input assumptions in HS1 Ltd's Base Case are too conservative and that the alternative approaches provided by HS1 Ltd and EIL are not appropriate for the reasons set out below. So, we have used the HS1 Ltd Base Case as a starting position to derive our approach, which uses largely the same methodology, but has less conservative inputs.

7.2. The Concession Agreement requires HS1 Ltd to take a 40-year approach to renewals. So, in our opinion, HS1 Ltd's '20-year' approach and EIL's 'Ratchet' approach (which looks at the next 15 years[70]) are not consistent with the Concession Agreement and HS1 Ltd should calculate the renewals annuity on a 40-year basis. Using a 40-year period better covers the life of the entire asset base and better smooths the peaks and troughs in expenditure over time[71], than a shorter time period does. This means the financial impact on operators will also be better smoothed over time.

7.3. HS1 Ltd's 'Buffer' approach and the 'Ratchet' approach have the disadvantage of excluding costs that will occur in the future and need to be funded. Some of these future costs are the result of operating trains now and in the past. But their options also exclude other costs that will happen in the future, e.g. cost shocks will happen on the renewals costs that HS1 Ltd has included in the calculation for years 11-40 as well as years 1-10[72]. Reducing the period over which these costs are paid will mean increases in the renewals annuity in the future, which may worsen the impact on operators.

7.4. None of the three alternative approaches are consistent with the principle that users should pay for the use of the asset and support inter-generational equity, as some renewals will not take place until after year 20, but the operators are using the assets now and the full costs of renewals should be funded not just the direct costs.

[70] This proposal uses direct and delivery integrator costs from the next three control periods, accounting for 100% of CP3, 100% of CP4 and 50% of CP5 costs.

[71] This is especially the case given the relatively high cost of renewals which take place after CP5, which would lead to increases in the renewals annuity for future control periods.

[72] Another example is that it is reasonable to assume a management fee is paid in the future ((if the current arrangements for the delivery of renewals are in place) and not just for the next 10 years as in the 'Buffer' approach.

Table 7.1 Summary of ORR, HS1 Ltd and EIL's proposals on the renewals annuity

Renewals annuity option	Renewals annuity (excluding ETCS) per year £m	Is the approach consistent with the Concession?	Does the approach include all categories of costs?
HS1 Ltd Base Case	35.3	Yes	Yes
HS1 Ltd '20-year' approach	25.1	No	Yes
HS1 Ltd 'Buffer' approach	23.9	Yes	No
EIL 'Ratchet' approach	22.5	No	No
ORR adjustments	26.1	Yes	Yes

7.6. As Table 7.1 shows, the only two approaches that are consistent with the 40-year outlook prescribed in the Concession Agreement and include all categories of costs are HS1 Ltd's Base Case and our approach. The main difference between these two approaches is that on most issues we think that HS1 Ltd's assumptions are too conservative, e.g. on asset life. It is only the final proposed adjustments in our approach for underfunding in CP1 and CP2 and to avoid negative escrow balances in CP9 and CP10 that reflect a different methodology.

7.7. Our proposed adjustments to HS1 Ltd's renewals annuity calculation are (summarised in Table 7.2):

(a) Our assessment of the inputs into the renewals annuity calculation, as set out in our asset management document, include the following changes to address the deficiencies we have identified:

(i) excluding the £2.9m per annum costs of ETCS because we have decided it should be treated as a Specified Upgrade;

(ii) an adjusted renewals profile (volume and direct/non-direct costs) resulting in reductions in the renewals annuity of £1.4m per annum;

(iii) an assumption that HS1 Ltd can be more efficient (that is, incur lower expenditure) in CP3 by 1.8%. This does not have a significant impact on the renewals annuity. We do not propose to carry forward this 1.8% renewals efficiency challenge into CP4-10. This is because of the fundamental difference in how the renewals forecast for CP3 was prepared by NR(HS) compared with the Bechtel forecast for CP4-10; and

(iv) proposed adjustments to the delivery integrator costs (an indirect cost) estimates over the 40-year period so that they more closely relate to the level of renewal activity, resulting in a reduction of £2.3m per annum.

(b) We have reviewed the assumptions relating to efficiency/productivity and risk and contingency and our draft conclusions are that:

(i) the efficiency challenge on HS1 Ltd is not sufficient, so we have recommended an efficiency overlay of 0.5% per annum resulting in a reduction in the renewals annuity of £2.6m per annum. This is largely consistent with recent frontier shift assumptions used by other economic regulators[73]; and

(ii) a risk and contingency assumption of 13% across the 40-year period is consistent with our expectations of the efficient management of financial risk. This is lower than HS1 Ltd's assumption of 26% in CP3 and 30% in CP4-CP10 and reduces the renewals annuity by £3.4m per annum.

(c) We consider HS1 Ltd's 1.22% interest rate assumption for Authorised Investments and 0.70% for escrow balances (in nominal prices) are too conservative and need to be more forward looking. So, we have assumed an average 2.5% nominal interest rate for all balances based on our view of forward interest rates. This reduces the annuity by £0.9m.

(d) We have also made a draft conclusion that the renewals annuity should address the underfunding of the escrow account in CP1 and CP2 and ensure the escrow balance is not negative over the 40-year period. This increases the renewals annuity by £1.6m.

[73] A frontier shift describes an increase in efficiency for a fully efficient organisation.

Table 7.3 Summary of ORR proposed adjustments and renewals annuity levels

Proposed adjustment	Renewals annuity impact (£m, Feb 2018 prices)	Renewals annuity levels (£m, Feb 2018 prices)
Excluding ETCS	-2.9	35.3
Total ORR renewals input views	-3.9	31.4
Efficiency overlay/frontier shift for CP4-10 of 0.5% per year	-2.6	28.7
Risk and contingency for CP3-10 of 13%	-3.4	25.3
Interest rates of 2.5%	-0.9[74]	24.5
Escrow balance underfunding, and to avoid escrow balances in CP9 and CP10 being below the level of renewals expenditure	+1.6	26.1

7.8. We consider these proposed adjustments are required to remedy the deficiencies we have identified and to ensure that the final 5YAMS is consistent with HS1 Ltd's General Duty. Our view is that a renewals annuity of £26.1m for CP3 will meet HS1 Ltd's General Duty and is a reasonable level. We note that this level of the renewals annuity is similar to the alternative levels proposed by HS1 Ltd and EIL[75].

7.9. We expect this renewals annuity to deliver an escrow balance of £146m at the end of CP3, £148m at the end of the Concession Agreement (that is, the end of CP6) and £64m at the end of CP10 (February 2018 prices).

7.10. We have considered the impact of our recommended renewals annuity on operators in our assessment of charges (see our supplementary document setting out our charging and incentives draft findings). Based on the evidence provided to us at present we do not consider that there will be an undue impact on operators as a result of our recommendation. In reaching this recommendation, we have taken into account the requirements of the Concession Agreement and our Section 4 duties.

[74] This adjustment is based on a renewals annuity of £25.3m, i.e. the £28.7m renewals level referred to in Table 2.4 less the reductions for risk and contingency of £0.1m and £3.3m.

[75] We note that converting our PR14 expected renewals annuities for CP3 and CP4 of £16.4 and £17.4m (both in 2012-13 prices) into 2018-19 prices would provide renewals annuities of approximately £18.9m in CP3 and £20.0m in CP4.

7.11. We have not adjusted the renewals annuity for costs that HS1 Ltd has omitted from its forecasts, e.g. some enabling works on additional depots/sidings and clean-up costs, as HS1 Ltd does not have a forecast of them. This would increase the renewals annuity. However, we are conscious that our interest rates forecast is likely to be conservative, especially after 20 years, as interest rates are historically low at the moment. Having a less conservative assumption would reduce the renewals annuity.

7.12. Based on the information available to us at this time, we think HS1 Ltd's 5.1% nominal vanilla cost of capital proposal requires further justification.

7.13. Overall, we consider that HS1 Ltd's proposals on its own subcontract and internal costs are reasonable but expect it to play a more proactive role in challenging efficiency as indicated in our asset management document. We also consider the pass-through costs and freight-specific costs to be reasonable.

7.14. The total expenditure we expect HS1 Ltd to incur in CP3 is £532m and the revenue we expect it to receive is £594m[76]. The difference between revenue and expenditure is because the renewals annuity (£130.5m) is higher than CP3 forecast renewals (£67.9m). The renewals annuity calculation averages renewals costs over a 40-year time period and is higher than the forecast renewals costs in CP3 largely because the assets in CP3 are still relatively young.

7.15. The incentives surrounding the financial framework require strengthening to encourage greater ownership of financial risk and delivery by HS1 Ltd. In light of this, we expect the monitoring and reporting in CP3 for HS1 Ltd in relation to its cost base, risk and contingency, escrow balance performance and efficiency to be strengthened.

[76] HS1 Ltd's revenue is summarised in the charges and incentives supplementary document.

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