Case ME/6971/21

[redacted]

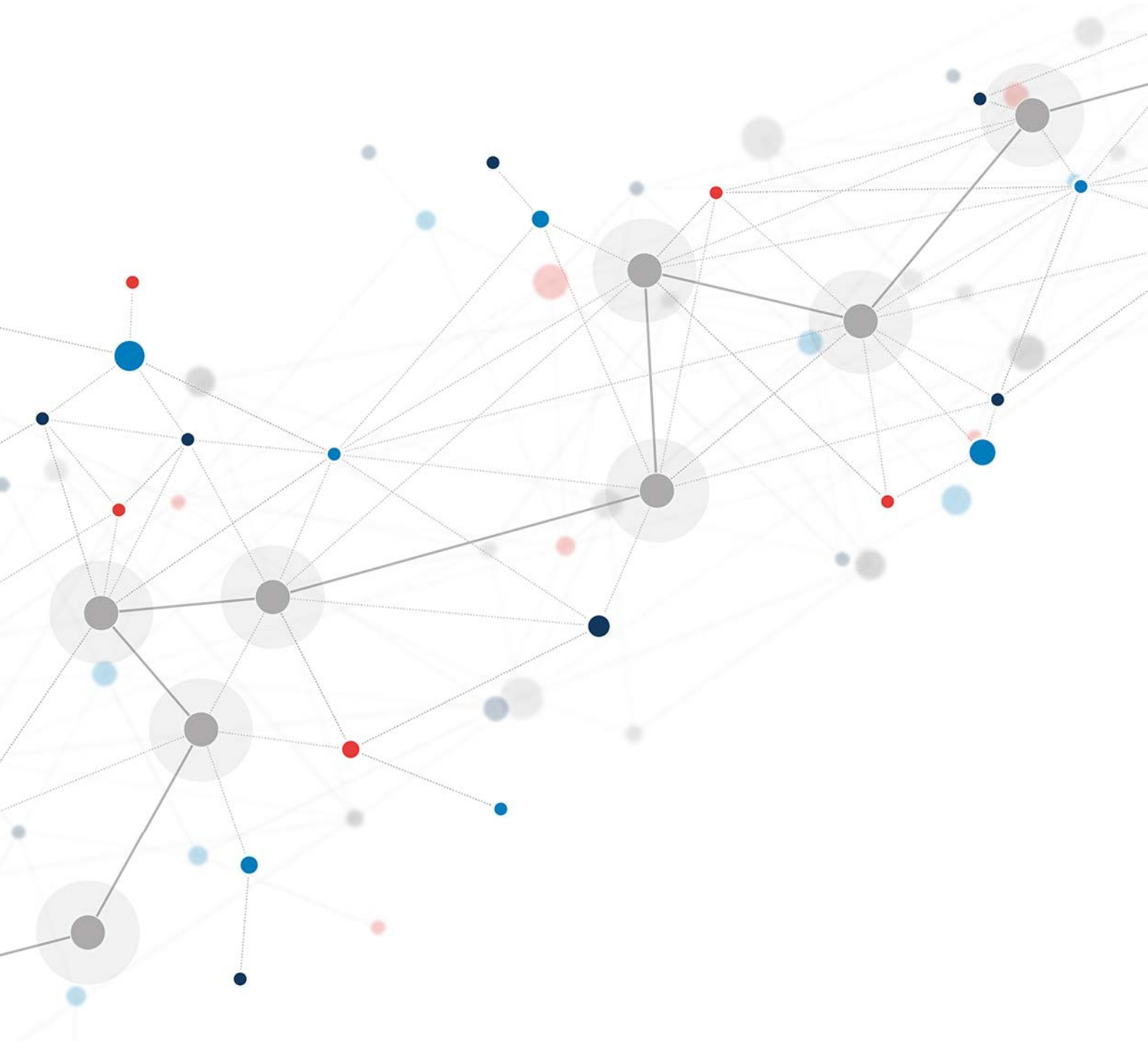
Assessing the competitive effects of the Transaction on TCSF

A submission to the CMA

[redacted]

4 April 2023

Strictly Confidential – Contains business secrets



Contents

1 Introduction and summary of conclusions

1.1 This is a submission to the CMA [redacted], in relation to Case ME/6971/21 concerning Hitachi Rail Ltd (Hitachi)'s proposed acquisition (the Transaction) of Thales SA's Ground Transportation Systems business (Thales; together with Hitachi, the Parties).

1.2 This submission covers only mainline signalling in the UK, and specifically the CMA's concern from Phase 1 that the Transaction could give rise to a Substantial Lessening of Competition (SLC) in the context of Network Rail's planned Train Control Systems Framework (TCSF) for procuring mainline signalling services from 2024. Consistent with the fact that the TCSF's emphasis (at least in Lot 2), as well as the focus of the CMA's concerns, is on modern digital, European Train Control System (ETCS) technology, this submission focuses on digital signalling projects within the TCSF.

1.3 Given that the CMA's test at Phase 2 is whether an SLC is more likely than not, we examine the likelihood of any SLC in the TCSF resulting from the Transaction on the basis of the facts of the industry and of the case, the Parties' respective competitive positions [redacted], and in the light of the economic principles, particularly in relation to how bidding takes place in auctions/tenders.

Summary of conclusions

1.4 The CMA's theories of harm in mainline signalling[1] in Phase 1 are founded on the concern that the Transaction may lead to an SLC in the bidding process to qualify for the TCSF, which is anticipated to be the main contractual framework for the award of UK mainline signalling projects over the next ten years.[2] The CMA considered that, in the counterfactual, the Parties would independently bid for, and be close competitors within, the TCSF, and in particular that the Transaction may eliminate a competitive constraint for the third position in the TCSF.[3]

1.5 We find that there are almost no circumstances in which such an SLC is plausible, hence an SLC cannot be considered more likely than not. This is for a number of reasons.

1.6 First, in the counterfactual:

a. [redacted][4] For these

1 In its Phase 1 decision, paragraph 438, the CMA considered that the Transaction might result in an SLC in the following markets within mainline signalling in the UK: the supply of digital interlockings and Automatic Train Protection (ATP) wayside equipment conforming to the ETCS standard (ETCS ATP wayside re-signalling projects); and (ii) Operation and Control Systems (OCS) projects. See paragraph 2.3 below.

2 Phase 1 decision, paragraphs 148 and 232.

3 Phase 1 decision, paragraph 228.

4 [redacted]

reasons, and consistent with the fact that the CMA did not raise concerns with respect to the supply of conventional signalling projects in the UK,[5] there is no prospect of an SLC for Lot 1, and we do not consider this further in our analysis.[6]

b. [redacted] an SLC for Lot 2 would also be unlikely. We set this out from **paragraph 3.8** onwards.

1.7 Second, [redacted] This is because:

a. The presence (or absence) of the other Party in the TCSF tender is one of the many uncertainties that bidders face, and is by no means the main one. [redacted] We set this out from **paragraph 3.24** onwards.

b. The Parties are not close competitors. As explained above, [redacted] As in previous frameworks, Atkins is uniquely placed between the two groups, as it is an integrator with a licence to a conventional interlocking approved for use in the UK, which is also compatible with future implementations of the ETCS. [redacted] We set this out from **paragraph 3.35** onwards.

c. [redacted]

5 Phase 1 decision, paragraph 318.

6 Accordingly, unless otherwise specified references in this paper to 'the TCSF' should generally be read to refer to Lot 2.

7 [redacted]

[redacted] We set this out from **paragraph 3.44** onwards.

1.8 Third, even if the CMA were to still consider that a loss of competition in the bidding for the TCSF cannot be excluded, any such hypothetical loss of competition between Hitachi and Thales would likely be outweighed by the increased competitive pressure that the merged entity would be able to exercise on the incumbents, Siemens and Alstom-Bombardier, [redacted].[8] We set this out from **paragraph 3.47** onwards.

1.9 All of the above relates to the effects of the Transaction on the bidding to qualify for the TCSF, which we understand to be the foundation of the CMA's concerns in mainline signalling from Phase 1. For completeness we also consider whether the Transaction is likely to result in an SLC in any subsequent mini-competitions within the framework period for the award of the contestable workbank. We find that an SLC is implausible even in this case, because [redacted] either:

a. The TCSF achieves its stated aims and creates equally capable ETCS suppliers, so with or without the Transaction there will be four credible competitors participating in the mini-competitions; or

b. Supplier capability *does* matter for subsequent work – but in that case the fact that the Parties are not close competitors, for the reasons described above, implies there can be no SLC. [redacted]

1.10 We discuss each of these possibilities in **Section 4**.

1.11 Finally, all of the above assumes that the TCSF is essentially implemented as planned and is essentially successful in attracting the intended number of bidders, because this is the premise for the CMA's concerns in Phase 1. [redacted][9]

1.12 For completeness we briefly consider whether the Transaction could result in an SLC if the TCSF fails or is scaled back. We find that it could not.

a. If the TCSF fails or is abandoned completely, Siemens and Alstom-Bombardier would still enjoy significant incumbency advantages [redacted] In that case, the Transaction does not remove a significant competitive constraint, so it cannot result in an SLC. In fact, the Transaction can only strengthen a challenge to the incumbents by creating a stronger, more effective player [redacted].

b. If the TCSF goes ahead but is unsuccessful in attracting bidders, [redacted] creating a difference between the post-Transaction situation and the counterfactual. If only three or four firms compete, they are likely to be the incumbents, [redacted]

8 [redacted]

9 [redacted]

[redacted] We set this out in **Section 5.**

1.13 In summary, in the most likely outcomes, [redacted]). Even if the CMA were still to perceive some small risk of diminished rivalry between the Parties, this would be outweighed by the enhanced rivalry arising from even a small increase in the merged entity's ability to offer a stronger challenge to the incumbents, given the structure of the mainline signalling industry in the UK.

2 Background and scenarios for the analyses

2.1 In this section we provide a brief description of the factual background for our subsequent analyses, including the Parties' activities and competitive landscape in mainline signalling in the UK and the expected structure of the TCSF.

2.2 As the CMA is aware,[10] even after the formal launch of the pre-qualification questionnaire (PQQ) for the TCSF in March 2023 [redacted] We set out below the scenarios that need to be considered while these uncertainties are still present.

Background

2.3 We begin by providing a general overview of the Parties' activities and their main competitors in mainline signalling in the UK.

2.4 As further explained below, the TCSF covers both conventional signalling projects (Lot 1) and digital signalling projects (Lot 2). Since the CMA has not raised concerns with respect to the supply of conventional signalling projects in the UK[11] [redacted] [12] we focus below on Lot 2 [redacted] and in particular on the specific types of projects for which the CMA has raised concerns:[13]

a. the supply of digital interlockings and automatic train protection (ATP) wayside equipment conforming to the ETCS standard (ETCS ATP wayside re-signalling projects), which are bundles of (i) ETCS ATP wayside solutions [redacted] and (ii) digital interlockings;[14] and

b. Operation and Control Systems (OCS) projects, which include (i) signalling control systems (SCS), which are deployed on top of interlockings to ensure the safe movement of trains according to timetables; and (ii) traffic management systems (TMS).[15]

The Transaction and the competitive landscape in UK mainline signalling

2.5 The Parties are active as OEMs in mainline signalling in the UK, but their activities are limited [redacted]

10 [redacted]
11 Phase 1 decision, paragraph 318.
12 See paragraph 1.6a.
13 Phase 1 decision, paragraph 12.
14 [redacted]
15 [redacted]

[redacted]

[redacted]

[20]

2.8 The largest suppliers of mainline signalling systems in the UK are Siemens and Alstom-Bombardier. They have experience across all subsystems, a strong national presence in multiple locations across the UK and are considered to benefit from significant incumbency advantages, with respect to both conventional and digital signalling systems:[21]

a. Siemens and Alstom-Bombardier represent a near duopoly of conventional interlockings. This constitutes a significant advantage as the other mainline subsystems need to interface with such interlockings. In recent years Siemens and Alstom-Bombardier have also accounted for an increasing share of Network Rail's major signalling spend, with their combined share increasing from approximately 70% in 1999-2004 to a projected 90% in 2019-2024.[22] This, in turn, gives them significant experience in relation to project delivery including important familiarity with Network Rail stakeholders and signalling principles in the UK.

b. Siemens and Alstom-Bombardier are the only suppliers expected to have digital interlockings as well as RBC and SCS approved for use in the UK by the time that the TCSF is awarded. Indeed, Siemens won the East Coast Development Programme, which effectively gives it a [redacted] share of supply for ETCS projects in the UK in 2012-2021.

16 [redacted]

17

18

19

20

21

22 Phase 1 decision, paragraph 154(a).

2.9 Given the above advantages, Siemens and Alstom-Bombardier are expected to play a significant role in competition for digital as well as conventional signalling projects in the next two control periods (CP7 and CP8, covering 2024-2034).

2.10 Another OEM with UK activities is Resonate, a specialist provider of OCS. Resonate benefits from a historical incumbency advantage in the UK because it owns, through acquisition, British Railways SCS technology (IECC), which can interact with Siemens' and Alstom-Bombardier's interlockings (which were also, originally, British Railways' technology).[23] In recent years, Resonate has accounted for around half of the installations for control systems in the UK.[24]

2.11 [redacted] These include Construcciones y Auxiliar de Ferrocarriles (CAF), Indra, Mermec and Stadler:

a. CAF has a portfolio of wayside products for use in Europe that could be adapted for UK entry. CAF has digital interlockings capabilities, ETCS solutions certified by the European Rail Agency, and SCS capabilities.[25]

b. Indra has references for its ETCS capabilities in Spain, and a digital-ready SCS solution.[26]

c. Mermec has a digital interlockings product for use in Europe and ETCS solutions certified by the European Rail Agency.[27]

d. Stadler has a digital interlockings product that is deployed outside the UK, and has ETCS ATP wayside re-signalling capabilities in Europe.[28]

2.12 Other players that have provided (or competed for) mainline signalling in the UK in the past are integrators, which use the technology owned by third-party OEMs to provide design and integration services for projects. These include Atkins, Linbrooke, VolkerRail, Amey, Babcock and Colas Rail.[29] Atkins, in particular, has been successful in securing UK signalling projects, and accounted for 8% of Network Rail's major signalling expenditure over the period 2014-2019 and 10% of Network Rail's signalling spend over the period 2021-2022 in the UK.[30] Atkins holds an exclusive licence to offer a conventional interlockings product (ElectroLogIXS) which is approved for use in the UK.[31] This product also forms part of the current installed interlockings base in the UK, and is compatible with future implementations of ETCS.[32]

2.13 The table below summarises the digital signalling capabilities of the main players in the UK and in Europe.

Table 1: Summary of suppliers' mainline signalling capabilities in the UK

[redacted]

23 The [redacted]
24 ORR Final Report, Figure 6.2 and paragraph 6.5.
25 [redacted]
26
27 .
28
29 Phase 1 decision, paragraph 53 (b).
30 [redacted]
31 ORR Final Report, paragraph 3.7.
32 [redacted]

Table 1: Summary of suppliers' mainline signalling capabilities in the UK

[redacted]

Notes: [redacted]
Source: [redacted]
Figure 2.

Key

- UK-approved conven ional and digital product available [redacted]
- No UK-approved digital product available, but UK-approved conventional product available [redacted]
- No UK-approved digital product available. EU-approved digital product available
- Provided conventional interlocking in the past in the UK through sub-contracting or licensing

The TCSF

2.14 As noted in the CMA's Phase 1 decision,[33] the Office of Rail and Road (ORR)'s 2021 market study found that the supply of mainline signalling in the UK suffers from a lack of competition, with the market essentially limited to the two incumbent suppliers, Siemens and Alstom-Bombardier.[34] The ORR estimated that these suppliers account for a projected spend of 90% of Network Rail's major signalling expenditure for the period 2019 to 2024, and that there had been a significant increase in the cost of signalling over time.[35]

2.15 The ORR also found that mainline signalling is characterised by high barriers to entry and expansion, partly as a result of Network Rail's procurement and contracting strategy over recent control periods, which features "*the use of frameworks with no guaranteed workbanks, tenders mandating the use of particular products owned and controlled by the incumbent suppliers, and the need to interface with the installed base*".[36] According to the ORR, this has made it harder for alternative suppliers to compete on equal terms to the incumbents.[37]

33 Phase 1 decision, paragraph 8.
34 ORR Final Report, page 7.
35 ORR Final Report, Figure 6.3 and paragraph 6.8.
36 Phase 1 decision, paragraph 154.
37 ORR Final Report, page 8.

2.16 In light of these findings, the ORR made a number of recommendations intended to increase competition from alternative suppliers, which Network Rail committed to implementing in the design of the tendering process for its next major signalling procurement, the TCSF.[38]

2.17 Network Rail first announced the proposed design of the TCSF in July 2022,[39] and the CMA's assessment of the Transaction in Phase 1 was based on the structure of the TCSF in July 2022.[40] In March 2023 Network Rail announced a new version of the TCSF, and formally launched the PQQ. Based on the instructions published with this update, the TCSF is currently expected to include the following features:[41] [42]

a. There is an indicative total workbank of up to £4bn, split into two lots: one for conventional signalling (Lot 1, worth up to £1bn) and one for digital signalling (ETCS or related technologies) (Lot 2, worth up to £3bn).

b. Network Rail intends to appoint up to four framework suppliers for each lot, with the allocation of work expected to be as follows:

i. A portion of the workbank [redacted] will be awarded through direct allocation. Bidders will be ranked on the basis of a number of technical and commercial evaluation criteria,[43] and will be awarded fixed proportions of the workbank based on their ranking [redacted].[45] Network Rail also set out the allocation percentages in the event that only three framework suppliers are appointed.[46]

ii. The remaining portion of the workbank [redacted] will be contestable by the qualified framework suppliers through mini-competitions.[47] These are understood to be follow-on tenders whose timing, scope, rules and scoring criteria will be specified on an *ad hoc* basis by Network Rail.[48]

38 Phase 1 decision, paragraph 9.

39 [redacted]

40 Phase 1 decision, paragraph 158.

41 [redacted]

42 The main features of the July 2022 version of the TCSF were the following: (a) Total workbank of [redacted], of which [redacted] for digital signalling projects and [redacted] for conventional signalling projects; (b) [redacted] of the total workbank would be guaranteed and awarded to five framework suppliers on the basis of their ranking in the tender process (with the first-ranked supplier awarded [redacted] (c) the remaining [redacted] the total workbank would be contestable over the period of the TCSF, based on suppliers' performance against key performance indicators [redacted]) and in mini-competitions [redacted]; (d) Network Rail would contribute to actual development costs of each framework supplier up to a maximum of [redacted] per supplier.

43 [redacted]

44 In other words [redacted].

45 In other words, [redacted]

46 For Lot 1, these are [redacted] of the directly awarded portion [redacted]. Network Rail TCSF instructions, Appendix A.

47 Network Rail TCSF instructions, Schedule 5.

48 Network Rail published two illustrative templates of the criteria and scoring documents for mini-competitions.

c. For Lot 2, to help facilitate non-incumbent suppliers to enter and expand in digital signalling, Network Rail will contribute to actual development costs up to a maximum of [redacted] per supplier. It is the first time this has been offered to suppliers as part of the procurement.

d. The framework will cover a 10-year period (corresponding to CP7 and CP8, i.e., 2024-2034), instead of five years as in previous control periods.

e. [redacted]

2.18 [redacted] the structure of the TCSF has changed significantly since it was first announced in July 2022 and remains in flux.[49] It is a ten-year framework, and many key elements (e.g., funding, political and industry support) are likely to change during this time. [redacted] For example, there may be fewer than four bidders participating in the tender, or fewer than four bidders may qualify for the framework award.

2.19 We now set out our approach to dealing with these uncertainties.

Scenarios considered in this report

2.20 We consider competition, and the effect of the Transaction, at two stages:

a. competition in bidding to qualify for Lot 2 of the TCSF; and

b. competition among qualified bidders for the contestable workbank.

2.21 We also need to take account of the significant uncertainties noted above about the TCSF's implementation and success in meeting Network Rail's objectives. We therefore assess the impact of the Transaction under different scenarios for how the TCSF might operate, if at all, namely:

a. Initially, assuming the TCSF is implemented as planned and succeeds in achieving Network Rail's aims (as set out in paragraph 2.17 above), i.e., the target number of bidders qualifies and Network Rail is able to award the intended workbank and contribute to development costs within the TCSF period.

b. Scenarios in which the TCSF is not implemented in the way Network Rail is envisaging [redacted] In the counterfactual, this would give rise to a continuation of the present competitive conditions in the industry, with Siemens and Alstom-Bombardier continuing to play a significant role in competition for mainline signalling projects, [redacted] whereas the Transaction would create a stronger competitor to the incumbents.

2.22 In this report we assess combinations of the above scenarios as follows:

a. In Section 3 we consider the impact of the Transaction on competition in the bidding to qualify for the TCSF. We first discuss the factors affecting bidders' decisions to participate in the tender

49 [redacted]

(including uncertainties related to the TCSF implementation). We then consider whether an SLC is plausible under the assumption that the TCSF is implemented as planned and is essentially successful.

b. In Section 4 we consider the impact of the Transaction on competition amongst qualified bidders for the contestable workbank, to be assigned via mini-competitions. We assume, as in the previous section, that the TCSF is implemented as planned and is successful.

c. In Section 5 we examine the competitive effects of the Transaction if Network Rail does not achieve the TCSF's objectives, either from lack of funding or lack of guarantees to prospective suppliers, or from a lack of supplier interest.

[redacted]

2.23 [redacted]

2.24 [redacted]

2.25 [redacted].

3 Competitive effects of the transaction on bidding to qualify for the TCSF

3.1 In this section we assess the economics of the TCSF and the factors affecting suppliers' decision to participate in the bidding to qualify for the TCSF. We then analyse the competitive effects of the Transaction on potential bidding, assuming that the TCSF is successfully implemented as planned [redacted]

3.2 Our analysis shows that an SLC is unlikely in this scenario. First, [redacted] Second, [redacted] Finally, [redacted]

The CMA's concern in Phase 1

3.3 The main concern underpinning the CMA's theories of harm in mainline signalling is that the Transaction may lead to a loss of competition in the bidding process to qualify for the TCSF.[50]

3.4 The CMA's assessment in Phase 1 was based on the earlier version of the TCSF, as first announced by Network Rail in July 2022. However, we have tested the CMA's concerns as applied to the March 2023 version of the TCSF, in particular Lot 2 (since the CMA has not identified any concerns with respect to conventional signalling projects). In the remainder of this paper, therefore, we focus on competition for Lot 2 of the March 2023 TCSF, and unless otherwise specified, the references to the "TCSF" should be understood to correspond to Lot 2 in the March 2023 TCSF.

3.5 Based on the evidence gathered during its Phase 1 investigation, the CMA considered that, in the counterfactual, the Parties would independently bid for, and be close competitors for, the TCSF.[51] Accordingly, the CMA considered that the Transaction may eliminate a competitive constraint for the third position in the TCSF, meaning that with the Transaction (all else equal) the third position may be won with a worse (higher) [52] bid than in the counterfactual.

3.6 For the CMA's concern to hold, all of the following conditions need to hold:

a. The TCSF is implemented as currently planned by Network Rail.

b. The bidding (largely) takes place after the Transaction.

50 Phase 1 decision, paragraphs 227-228.

51 Phase 1 decision, paragraph 228.

52 In this section, for simplicity, we assume that bids are based on bidders' costs, and we rank bidders on the basis of their costs, so that bidder 1 is the lowest-cost bidder that places first and wins slot 1, bidder 2 the second lowest-cost bidder that places second and wins slot 2, etc.

c. In the counterfactual [redacted]

d. In the counterfactual at least one of the Parties would regard the other as a rival for the slot it targets, to an extent that would affect its bid.

e. The difference between the value of the two slots that the Parties would win by bidding independently in the counterfactual is material, to an extent that would affect their bids.

f. Any lost competition between the two Parties would exceed the rivalry-enhancing effects of the Transaction, and in particular the stronger competitive constraint that the merged entity would place on Siemens and/or Alstom-Bombardier.

3.7 We note again that, as was the case in other framework procurements, there are still significant uncertainties concerning the funding, timing and outcomes of the TCSF, particularly for digital projects. Despite these uncertainties, in the rest of this section we assume that conditions (a) and (b) apply, and focus on the remaining conditions.

[redacted]

3.8 [redacted]

3.9 In Phase 1, [redacted], the CMA considered that both Parties are likely to bid in the TCSF.[53]

3.10 [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

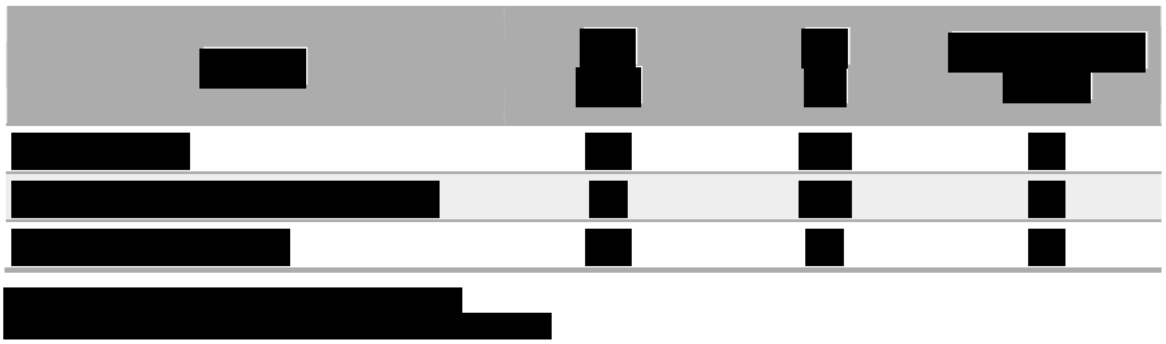
[redacted]

53 Phase 1 decision, paragraphs 163 to 167.

54 [redacted]

[redacted]

3.15 [redacted]



[redacted]

55 [redacted]

[redacted]

57 [redacted]

58 [redacted]

59 [redacted]

60 [redacted]

[redacted]

62 [redacted]

63 [redacted]

[redacted]

3.19 [redacted]

[redacted]

[redacted]

[redacted]

3.22 [redacted]

3.23 [redacted]

64 [redacted]

65 [redacted]

66 [redacted]

67 [redacted]

68 [redacted]

[redacted]

The presence or absence of the other Party is a small uncertainty, compared to the other unknowns affecting the decision on whether and how to bid

3.24 [redacted]

3.25 [redacted] In reality, the variables affecting the profitability of participating in the TCSF are not straightforward to identify and quantify. Quite apart from the overall uncertainty about the TCSF design and success,[70] bidders face uncertainty over:

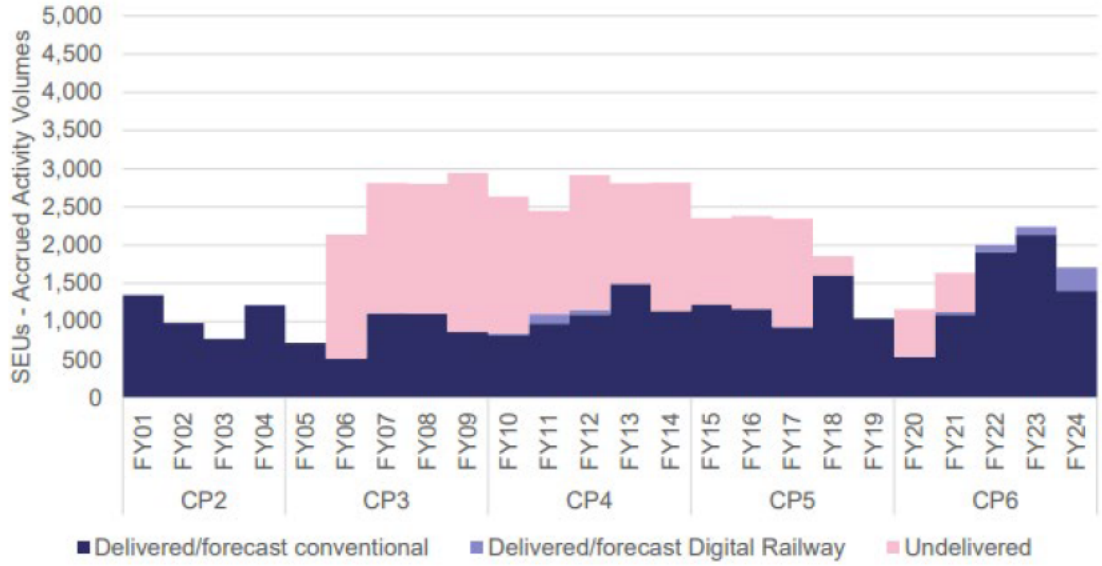
a. The work beyond the guaranteed workbank: the subsequent [redacted] workbank is not guaranteed for bidders who are awarded a portion of the initia [redacted] since it is awarded on the basis of mini-competitions [redacted].[71] Even more, the value of the TCSF lots is only indicative at this stage,[72] and [redacted]

b. Timing of revenue generation: [redacted] there are uncertainties as to how early they could expect to generate sufficient revenues to recover their initial costs [redacted][76]

69 See paragraph 3.35 onwards.
70 This is further discussed in Section 5.
71 [redacted]
72 [redacted]
73 [redacted]
74 [redacted]
75 [redacted]
76 [redacted]

c. The split of the workbank between conventional and digital signalling: [redacted] [77] Furthermore, of the [redacted] ETCS projects that Network Rail intends to award within the TCSF, [redacted]

Figure 1: Historical planned vs. delivered volume of work, Network Rail



Notes: Since the ORR report was published in November 2021, all the years from FY22 onwards reflect forecasts, and accordingly the undelivered volume of work is not indicated.
Source: ORR Final Report, Figure 7.1

[redacted]

77 See footnote 42.

78 [redacted]

79 [redacted]

3.27 We then compare the profitability of participation in these scenarios to the profitability of placing fourth instead of third in the tender, shown in the last row of [redacted] below. In the CMA's framework from Phase 1, which considers the Parties to be close competitors for the third slot in the TCSF, this differential in profitability captures the potential effect of one Party's participation in the bidding to the expected profitability of participation for the other Party, in a counterfactual without the Transaction.

3.28 [redacted]

3.29 In any case, for the reasons we explain below, in practice the differential between qualifying third or fourth over-states the degree of competition between the two Parties, in a counterfactual without the Transaction.

Framework for assessing the effects of the Transaction on competition

3.30 In order to address the CMA's concerns from Phase 1, we set out a framework for assessing the effects of the Transaction on competition assuming that (i) the TCSF is implemented as currently envisaged by Network Rail, and (ii) in the counterfactual both Parties would bid independently and

would be placed third and fourth.[80] As explained in this report [redacted] we examine this as the framework within which we understand the CMA's concerns from Phase 1 to be situated.

3.31 In this framework, the impact of the Transaction on competition in the TCSF bidding can be separated into two main potential effects, which depend on the 'bidding strength' of the Parties with and without the Transaction, where 'bidding strength' is a supplier's ability to score well on Network Rail's criteria. It thus includes commercial ('cost'), delivery (including project behaviour) and technical aspects. The two potential effects are the following:[81]

a. a potential anticompetitive effect, resulting from the hypothetical removal of bidder 4 (the weaker Party, by assumption in this framework reflecting the CMA's stated concerns) from the TCSF tender as a result from the Transaction, leading to a higher bid for the third position and reduced competitive pressure for the bidders targeting the top two positions ('loss of rivalry' effect); and

b. a potential pro-competitive effect, resulting from the creation of a stronger bidder as a result of the Transaction, with the ability to better compete for a larger share of the projects to be procured under the TCSF, increasing the competitive pressure on the incumbents Siemens and Alstom-Bombardier.

3.32 The size of these effects depends on the following parameters:

a. For the potential anti-competitive effect:

i. Any difference in bidding strength between bidder 3 and bidder 4 (the Parties, by assumption in the CMA's framework [redacted]). All else equal, the smaller this gap (so the Parties are closer competitors), the more intense competition for the third position in the counterfactual, and the higher the potential for an SLC.

ii. Any difference in bidding strength between bidder 2 (Siemens or Alstom-Bombardier) and bidder 3 ([redacted]). The larger this gap, the more likely that the Parties would compete closely for the third position, thus the higher the potential for an SLC.

iii. Any difference in bidding strength between bidder 4 ([redacted]) and the lower bidders. All else equal, the smaller this gap, the lower the potential for an SLC, because the Transaction would cause only a marginal reduction in the competitive constraints on bidder 3. The larger this gap, the higher the potential for an SLC due to the removal of a more significant competitive constraint on bidder 3.

b. For the potential pro-competitive effect:

i. The improvement of the merged entity's bidding strength.

80 [redacted]

81 See footnote 52 for the explanation of notation.

ii. Relatedly, the extent to which the Transaction closes the gap vis-à-vis Siemens and Alstom-Bombardier, creating a stronger challenger to bidder 2.[82]

The more significant the improvement in the merged entity's competitive position, the less plausible an SLC because of the enhanced rivalry for the top positions in the tender.

3.33 Depending on the relative size of the above, the Transaction may not give rise to material anti-competitive effects, or, if any anticompetitive effects arise, they may be outweighed by the pro-competitive effect.

3.34 Below we analyse the evidence on the relevant parameters. This analysis shows that, on the facts of the case, an SLC is unlikely to arise.

The Parties are not close competitors for the TCSF

3.35 As noted in paragraph 3.32, a small difference in bidding strength between bidders 3 and 4 (i.e., the Parties in the CMA's framework from Phase 1) would make them close competitors, creating the risk of an SLC from losing competition between them. A large gap between bidder 2 and bidder 3 also creates the risk of an SLC, because it reduces the incentives of bidder 3 to consider competing for the second position.

3.36 The CMA's concerns from Phase 1 are based on a characterisation of competition where both of the above apply. According to the Phase 1 decision (adjusting to reflect the March 2023 version of the TCSF), there are essentially three groups of firms: (1) Siemens and Alstom-Bombardier competing for the top two positions; (2) Hitachi and Thales competing for the third position; and (3) all other competitors targeting the fourth position.[83] In effect, the CMA considered that the Parties may be particularly close competitors,[84] thus an SLC may arise from the loss of competition to place third between Hitachi and Thales. In reality, this conclusion is highly simplistic, as the facts of the industry do not support the notion that the Parties are close competitors in bidding to qualify for the TCSF.

3.37 As noted above, the profitability of the TCSF to a supplier is principally driven by (i) the need for up-front investment to qualify the ETCS technology [redacted]; and (ii) timing and value of projects (i.e., revenue generation). [redacted]

3.38 [redacted] As noted in paragraph 2.8, the two incumbents are expected to have both conventional and digital signalling products approved for use in the UK by the time the TCSF is awarded (and therefore would have to make little to no extra investment to be able to supply the products covered by the TCSF), while Atkins will have a digital interlocking. These are also existing and experienced suppliers to Network Rail, and would therefore be well-placed to score highly in mini-competitions. [redacted]

82 The pro-competitive effect is stronger if bidder 3 can target the first position.
83 Phase 1 decision, paragraphs 228-231.
84 Phase 1 decision, paragraph 181.

[redacted]

3.39 [redacted]

3.40 These conditions significantly affect the expected profitability of TCSF and therefore participants' bids. [redacted]

[redacted]

[redacted]

3.41 [redacted]

3.42 Other potential bidders can also be classified according to whether they possess these advantages or not.

[redacted]

85 [redacted]

86 [redacted]

87 [redacted]

88 [redacted]

[redacted]

c. Integrators (in particular Atkins, Amey, Linbrooke and Volker Rail) are likely to be in an intermediate position between these two groups. Integrators lack the signalling technology (with the exception of Atkins) but have significant delivery capabilities in certain local areas (covering, e.g., design, installation, testing and commissioning), local capabilities and manpower, and familiarity with managing Network Rail's signalling projects and stakeholders. Integrators would be able to procure signalling technology from the incumbents (thereby not requiring any further product approval) or form consortia with European OEMs,[89] and compete aggressively for the TCSF. Atkins is in a unique position as it has a licence to an UK-approved conventional interlocking that is also compatible with ETCS applications.[90]

3.43 [redacted]

a. [redacted]

b. [redacted]

c. [redacted]

[redacted]

3.44 [redacted]

3.45 [redacted]

89 [redacted]

90 See Section 2.

[redacted]

3.46 As noted above[91] [redacted]

a. CAF has digital interlockings capabilities, ETCS solutions certified by the European Rail Agency, and SCS capabilities that could be adapted for UK entry. It also has strong ETCS credentials, including at least seven European references for ETCS re-signalling.[92] [redacted][93]

b. Indra has references for its ETCS capabilities in Spain, and a digital-ready SCS solution. [redacted]

c. Stadler has a digital interlockings product and ETCS ATP wayside re-signalling capabilities in Europe. Since entering the European signalling market in 2016, Stadler has made significant investment in signalling and indicated a desire to be a one-stop solution provider, including by establishing signalling division, with over 500 employees across 7 sites in 2022.[95] [redacted].

d. Resonate, a specialist provider of OCS with a leading position in the UK, [redacted][96]

e. Atkins and other integrators such as Linbrook, Amey and and Volker Rail [redacted], given Network Rail procured this model previously in its major mainline signalling frameworks and signalling and telecoms (S&T) frameworks. They could partner with one of the above OEMs, or procure the technology from the incumbents to overcome the lack of approved signalling products, and then leverage their strong delivery capabilities to score highly on the TCSF tender criteria.

The merged entity would pose a stronger constraint on the Siemens and Alstom-Bombardier duopoly

3.47 Having considered the evidence on each of the gaps between potential bidders that we set out in paragraph 3.32a above, and explained that there is no support for the conclusion that the Transaction is likely to result in an SLC, for completeness we also now consider the factors set out in paragraph 3.32b, i.e. the extent to which the Transaction improves the strength of the merged entity in bidding (compared to the stronger of the two Parties in the counterfactual). As explained in paragraph 3.32b, a significant improvement in the merged entity's competitive position makes an SLC less plausible because it creates enhanced rivalry in the tender.

3.48 As explained in Section 2, the ORR's 2021 market study found that mainline signalling in the UK has effectively been a duopoly between Siemens and Alstom-Bombardier (or their predecessors), and that barriers to entry or expansion have been significant. Accordingly, Network Rail's objective

91 See Section 2 and paragraph 3.42c.
92 [redacted]
93
94
95
96

with the TCSF is to introduce a competitive threat to Siemens and Alstom-Bombardier, encouraging entry and assisting suppliers to qualify their products.[97]

3.49 In any auction/tender, having more credible bidders would generally equate to more competitive bids (and better outcomes for the auctioneer); conversely, having fewer credible bidders equates to less competitive bids (and worse outcomes). As noted in paragraph 3.5, in Phase 1 the CMA focused on the reduction in the *number* of bidders caused by the Transaction as possibly leading to reduced rivalry in the tender (in particular for the third position). This view is misplaced for two reasons.

3.50 First, as explained above, the Transaction does not reduce competition for the third position in the TCSF, because the Parties are not close competitors [redacted].

3.51 Second, the Transaction increases the Parties' ability to provide a more significant challenge to Siemens and Alstom-Bombardier [redacted]

3.52 As noted in the Parties' submission on the benefits of the merger, the merged entity will be better-placed [redacted] to bid effectively against Siemens and Alstom-Bombardier. In particular, the merged entity [redacted]

a. [redacted]

b. [redacted]

3.53 The Parties further expect that the combination of their resources would lower their overheads through the elimination of double marginalisation in the procurement [redacted] and generate supply chain synergies and procurement synergies.[100] [redacted]. Any such increased tension in bidding for the top positions in the TCSF effectively changes the dynamics of bidding and would have a very significant, positive effect, for two reasons.

3.54 First, the existing position of Siemens and Alstom-Bombardier would give them strong chances of obtaining the top two positions in the counterfactual. As noted in the 2021 ORR market study, the combined market share of the two incumbents has increased over the years and there has been a significant increase in the cost of signalling.[102] This is consistent with the outcome that would be

97 See paragraphs 2.14-2.17.

98 [redacted]

99 [redacted]

100 [redacted]

101 [redacted]

102 Phase 1 decision, paragraph 59. ORR market study, figures 6.1 and 6.3.

expected in a duopoly, where the lack of competitive pressure (or, in this case, of competitive awards) results in higher equilibrium prices.

3.55 An increase in the competitive pressure on the top two positions would make these higher prices harder to sustain. The ORR indeed noted that average prices paid by Network Rail are consistently lower when projects are competitively tendered as opposed to directly awarded, suggesting that more competition and more viable players for both frameworks and individual tenders drive better value for money.[103]

3.56 Second, the TCSF guarantees more work for higher-placed bidders, so increased rivalry for larger slots is worth more (in terms of its pro-competitive effects) than any hypothesised reduced rivalry for smaller slots. It is hard to model such increased rivalry explicitly, because it reflects uncertainty in a new market situation. Most standard economic models assume common knowledge of the economic environment, such as the auction/tender rules and the probability distribution over the capabilities of rival bidders.[104] In such models, bidders are assumed to have correct beliefs on average.[105] Therefore (for example) a challenger for the second slot would be commonly known to succeed with a certain probability, and the third-placed firm would be assumed to bid on average no more competitively than is needed to secure the third slot (without regretting bidding too high when it learns the outcomes).[106]

3.57 However, the TCSF is a new framework for the introduction of a new technology in the UK mainline system, with no prospect of learning from repeated bidding, that could justify the use of a framework in which bidders were assumed to know one another's costs and bidding functions. In such circumstances, neck-and-neck competition between the suppliers that will end up second and third is a realistic possibility, driving bids down to highly competitive levels. This same tension then also increases the risk to the best-placed supplier that it will not obtain the number one slot.

Conclusion

3.58 Our analysis shows that, in the event that the TCSF is implemented essentially as planned and is essentially successful in achieving Network Rail's objectives, the conditions for the CMA's concerns from Phase 1 to hold are not fulfilled, and therefore the Transaction is unlikely to give rise to an SLC at the tendering stage.

3.59 [redacted]

103 Phase 1 decision, paragraph 154. ORR market study, page 8.

104 See for instance: Monderer and Samet (1989) *"[…] common knowledge can be approximated by the weaker and more easily obtained condition of common belief. This approximation justifies the standard assumption in game theory that the description of the game is common knowledge."*; and Klemperer (2014) *A survey of auction theory*, p. 40 *"Bidder i values the unit at v_i, which is private information to her, but it is common knowledge that each v_i is independently drawn from the same continuous distribution F(v)"*.

105 See for instance Milgrom (2003), *Putting auction theory to work*, p. 29-30

106 See for instance: Milgrom (2003), *Putting auction theory to work*, p. 16 *"Game theoretic equilibrium models also assume not only that bidders maximize accurately but also that they are themselves completely confident that others will maximize accurately."*; and Engelbrecht-Wiggans (1989) *"While most models of auctions and competitive bidding assume that each bidder's utility for an outcome depends only on his own profit, we allow the utility to also depend on any regret that a bidder suffers after the fact and characterize when and how this affects bidding."*

[redacted]

3.60 Second, [redacted] other unknown variables related to the implementation of the TCSF, including the number and timings of digital projects awarded and the funding that Network Rail will be able to guarantee, are more important in determining the expected profitability of participation in the TCSF than the size difference between consecutive lots (and therefore the effect of the participation of a similar bidder).

3.61 Third, the relative positions of the Parties, compared to other bidders, do not make an SLC plausible. In particular, the Parties are not one another's closest competitors. [redacted]

3.62 [redacted]

3.63 Finally, any minor effect arising (in the CMA's framework from Phase 1) from lost competition between the Parties for the third position in the TCSF would be outweighed by even a small increase in the degree of likelihood of the merged entity providing greater competition to Siemens and Alstom-Bombardier. [redacted] This changes the dynamics of bidding in the TCSF and increases competition. Even without such a change in dynamics (or any of the other factors above that rule out an SLC), improvements in the merged entity's bid are likely to produce pro-competitive that would more than outweigh any (unlikely) anti-competitive effects.

3.64 Given the above, there can be no plausible SLC in the bidding to qualify for the TCSF as a result of the Transaction.

4 Effects of the transaction on competition between qualified bidders for digital projects under the TCSF

4.1 In this section we assess whether the Transaction is likely to affect competition between qualified suppliers (after the ITT) for contestable digital signalling projects, assuming the TCSF is implemented as planned.[107]

4.2 There is still a degree of uncertainty as to the criteria for the award of the contestable portion of the workbank,[108] and the CMA in Phase 1 did not specifically analyse the mechanisms through which the Transaction might result in an SLC in these mini-competitions. However, our analysis shows that, considering all plausible mechanisms and outcomes of the mini-competitions, an SLC is highly unlikely to arise.

The conditions for an SLC in mini-competitions

4.3 As explained in Section 2, Network Rail intends to award [redacted] of the digital TCSF workbank directly after the initial bidding stage, while the remaining [redacted] is expected to be contestable via mini-competitions, with timing, scope, rules and scoring criteria to be specified on an *ad hoc* basis by Network Rail.[109] We understand that the TCSF will be the main contractual mechanism through which suppliers will be awarded major signalling projects over the next two control periods, and that (at least for major conventional signalling projects and the delivery of ETCS projects) only those suppliers that have qualified in the initial TCSF bidding will have a chance to compete for the contestable projects.[110]

4.4 In principle, an SLC could arise were the Transaction to reduce competition for this contestable workbank compared to the counterfactual. For this to be plausible, all of the following necessary conditions would have to hold:[111]

a. At least part of the contestable workbank is awarded, as currently planned by Network Rail.

107 [redacted]

108 See paragraph 2.17.

109 Network Rail published two illustrative templates of the criteria and scoring documents for mini-competitions as annexes to Schedule 5 of the Network Rail TCSF instructions.

110 See paragraph 2.17. See also paragraph 4.5 of Network Rail's TCSF Instructions to Participants (TCSF 29248 - Instructions to Participants (MS Comments).pdf).

111 These are separate/additional to the conditions for the CMA's concern regarding competition in the TCSF tender from Phase 1.

b. In the counterfactual both Parties would be among the four qualified bidders post-ITT, but post-Transaction there would be one different (presumably fourth) successful bidder that would not have qualified without the Transaction.

c. This new (fourth) supplier provides a weaker constraint on competition for work beyond the initial workbank than the weaker Party would have done in the counterfactual.

d. Any lost competitive pressure in the mini-competitions would exceed the rivalry-enhancing effects of the Transaction, and in particular the stronger competitive constraint that the merged entity would place on Siemens and/or Alstom-Bombardier.

The Transaction does not reduce competitive pressure in mini-competitions within the TCSF

4.5 As explained in the previous sections, there are still significant uncertainties regarding most if not all aspects of the TCSF [redacted][112].[113]

4.6 Even if part or all of the contestable workbank is indeed awarded, bidders face uncertainty about the type, timings or criteria for the award of these projects.[114] Nonetheless, as we set out below no SLC would arise under any likely scenario.

4.7 Bidding to qualify for the TCSF would determine the set of suppliers capable of participating in any mini-competition. On Network Rail's current plans, after the ITT there would therefore be, in principle, four suppliers capable of participating in any mini-competition. This would be true both in the counterfactual and post-Transaction [redacted]).

4.8 There is no plausible scenario in which the Transaction would materially reduce the competitive pressure in such mini-competitions, considering the following different circumstances:

a. [redacted]

b. [redacted] We understand that Network Rail's intention is that all qualified suppliers in the TCSF should be considered on an equal level in the mini-competitions, i.e., their initial ranking in the bidding would not matter in the subsequent award of projects via mini-competitions. Consequently a change to the identity of one supplier should make no difference to their ability to win projects in mini-competitions. In qualifying its technology under the TCSF, the new

112 [redacted]

113

114 See paragraph 2.17.

supplier that might not have succeeded in the counterfactual, would become capable of carrying out work for Network Rail and thus would be *capable* of winning mini-competitions.

c. In any case, to the extent that there are different strengths and weaknesses in different qualified suppliers, and some suppliers might be stronger than others in mini-competitions, an SLC would arise only if the Parties are seen as particularly close competitors to one another in a way that could affect the outcome of the mini-competition. However, for the reasons set out in Section 3, this is not the case:[115]

   i. In practice, as much as they are the strongest competitors in the initial bidding to qualify, the strongest competitors in any mini-competition would be Siemens and Alstom-Bombardier. Consequently, unlike the initial bidding where multiple suppliers qualify, in the subsequent stages of the TCSF there can be no meaningful competition for 'third place' or any other losing position, and consequently no loss of competition in the middle of the rankings, as the CMA hypothesised for the initial bidding.

[redacted]

Conclusion

4.9 Our analysis shows that, considering all plausible outcomes on the award of the contestable work under the TCSF, no SLC arises in competition for such work because the Transaction cannot influence the set of qualified suppliers in a way that would harm competition.

4.10 Effectively, the CMA's concerns from Phase 1 depend on a 'competition to come third'. This competition might be relevant to qualify for the TCSF, but will not materialise in mini-competitions because projects will be awarded to a winner. Given this, no SLC is likely because the Parties are not close competitors with any prospect of placing first and second in a mini-competition. In fact, as the most likely winners of such mini-competitions are Siemens and Alstom-Bombardier, the Transaction is more likely to enhance rivalry in mini-competitions by creating a stronger challenger to those incumbents.

115 See paragraph 3.35.

5 Competitive effects if Network Rail does not achieve the TCSF's objectives

5.1 Our analysis so far assumes that Network Rail is successful in attracting four credible bidders and awards the workbank as set out in the current rules. However, as explained in Section 3, the economics of the TCSF remain challenging for the operators that Network Rail seeks to attract. We summarise the main obstacles to the success of the TCSF below.

5.2 Accordingly in this section we examine scenarios in which, either by choice or from lack of supplier interest, ETCS services are procured from a smaller set of suppliers, and we demonstrate that no SLC can plausibly arise in those scenarios.

[redacted]

5.3 [redacted]

[redacted]

[redacted]

5.4 [redacted] 117

5.5 [redacted]

5.6 [redacted] 118

116 [redacted]

117

118

[redacted]

5.8 Network Rail has already scaled back its ambitions for the TCSF, by reducing the proportion of digital signalling work from [redacted] to [redacted],[119] [redacted].[120] Either way, as we explain below, the competitive environment in the counterfactual following a significantly scaled back, or unsuccessful, version of the TCSF would be different from that envisaged by the CMA in Phase 1.

No SLC can plausibly arise if the TCSF is not successful

5.9 Below we examine the effects of the Transaction in scenarios in which, either by choice or from lack of supplier interest, ETCS services are procured from a smaller set of suppliers than Network Rail is currently hoping for. We cannot identify all of the outcomes that a 'failed' TCSF could lead to, but we consider two cases that could plausibly arise:

a. A 'no TCSF' scenario in which Network Rail does not provide any support or guaranteed workbank to bidders, so the [redacted].

b. An intermediate scenario, in which there are some new suppliers but the TCSF does not work as envisaged by Network Rail to attract several credible new entrants in mainline signalling markets in the UK.

'No TCSF' scenario

5.10 As explained in Section 2, the TCSF has its origins in the ORR's concern about a duopoly in mainline signalling in the UK. The TCSF responds to this concern by providing additional support for new entrants, both through financial contribution to investment and the guaranteed workbank.[121]

5.11 Without such a change to the procurement structure, the most likely outcome is that there would be few operators capable of challenging the existing duopoly: at best, only bidders that have had some success in the past – [redacted]

5.12 Even if, despite Network Rail's stated intentions, these circumstances were to materialise, the Transaction cannot result in an SLC, as to do so would require that Thales exerts a meaningful competitive constraint in mainline signalling markets in the UK. It has not been able to do so in the past [redacted]

5.13 [redacted]

119 See footnote 42.

120 [redacted]

121 See paragraphs 2.14-2.17.

[redacted] In such a scenario, the only plausible effects of the Transaction would be pro-competitive: [redacted]

TCSF partially fails, only succeeds in attracting four or fewer bidders in the counterfactual

5.15 Alternatively, there could be scenarios in which the TCSF is implemented but succeeds in attracting only four or fewer bidders in the counterfactual. As a result, the Transaction could reduce the number of qualified suppliers by one. As explained below, no SLC is plausible in any of these scenarios.

5.16 First, if there are three bidders in the counterfactual this would be because at least one of the Parties ([redacted]) did not bid. Accordingly, no SLC would arise.

5.17 This leaves the possibility that in the counterfactual only four bidders would appear, including both Parties, leaving only three successful bidders post-Transaction. In the CMA's framework from Phase 1 this could theoretically result in an SLC, but for such a concern to be valid there would need to be a sufficiently large difference (in terms of competitive strength) between both Parties and other firms (otherwise there is another 'just losing' firm, to replace one of the two Parties, [redacted]). Such a distinction between the two Parties, on the one hand, and all other suppliers, on the other, is not plausible because the Parties are not close competitors, for the reasons set out in Section 3.

5.18 More specifically, and considering these scenarios in turn:

a. An outcome with only three bidders in the counterfactual, including both Parties (as would be required for the question of an SLC to emerge) is practically impossible. It would require not only that either Siemens or Alstom-Bombardier would not bid, [redacted]

b. An outcome with only four bidders in the counterfactual, again including both Parties (as would be required for the question of an SLC to emerge), also seems unlikely, [redacted]

Conclusion

5.19 The CMA's theories of harm in mainline signalling from Phase 1 are linked very specifically to the TCSF. As demonstrated in Sections 3 and 4, no concerns can plausibly arise if the TCSF is implemented as intended. *A fortiori* then, in the absence of this major change to the market, given current market conditions no concern about an SLC can plausibly arise.

5.20 If the TCSF was abandoned entirely, the Transaction could only enhance rivalry in mainline signalling, not diminish it, by creating a stronger contender to the incumbent suppliers Siemens and Alstom-Bombardier.

5.21 That leaves the possibility of a partially implemented or partially successful TCSF. We cannot identify all of the outcomes that such 'reduced form' TCSF could lead to. However, based on the conceivable scenarios discussed above, there are no circumstances in which the Transaction is more likely to be anti-competitive than pro-competitive.

5.22 Given this set of outcomes, it is hard to see how the CMA could identify a specific counterfactual that it considers most likely, in which an SLC is more likely than not.

6 Conclusion

6.1 Our analysis demonstrates that there are no circumstances under which the Transaction is more likely than not to lead to an SLC, either in the bidding process to qualify for the TCSF or in the subsequent competition for signalling projects covered by the TCSF contestable workbank. This conclusion applies under all conceivable outcomes of the TCSF, whether it is implemented as currently envisaged by Network Rail, whether it is only partially successful, or whether it is essentially unsuccessful.

6.2 First, we show that, even if the TCSF is successful, there is no basis for the concern expressed by the CMA in Phase 1 that the Transaction may eliminate a competitive constraint for the third position in the TCSF, whether with five slots expected to be available as at the Phase 1 Decision, or the four Network Rail now expects to award.[122] This is because:

a. [redacted]

b. [redacted] The presence (or absence) of the other Party in the TCSF tender is one of the many uncertainties that bidders face, and by no means the main one. In any case, the Parties are not close competitors for the TCSF [redacted]

c. Any (implausible) loss of competition in the bidding for the TCSF as a result of the Transaction would be outweighed by the increased competitive pressure that the merged entity would be able to exercise on the incumbents, Siemens and Alstom-Bombardier, [redacted]

6.3 Second, we demonstrate that no SLC can plausibly arise in any subsequent mini-competitions within the framework period for the award of the contestable workbank ([redacted] This is because the competitive conditions for such mini-competitions are those created in the bidding for the TCSF; as the Parties are not close competitors in the bidding to qualify for the TCSF, they are also not close competitors in the subsequent awards of specific projects.

6.4 Finally, we demonstrate that no SLC is likely if the TCSF is scaled back significantly or abandoned. In that event, [redacted] the Transaction would remove no significant competitive constraint, so it can cause no SLC. In fact it can only strengthen

122 Phase 1 decision, paragraph 228.

a challenge to the incumbents with the creation of a stronger, more effective player [redacted].

Glossary

Defined term	Definition
ATP	Automatic Train Protection
ETCS	European Train Control System
GRIP	Governance for Railway Investment Projects
IECC	Integrated Electronic Control Centre
IRR	Internal Rate of Return
ITT	Invitation To Tender
JV	Joint Venture
NPV	Net Present Value
NR	Network Rail
OEM	Original Equipment Manufacturer
ORR	Office for Rail and Road
PQQ	Pre-Qualification Questionnaire
[redacted]	[redacted]
SCS	Signalling Control Systems
S&T	Signalling and Telecoms
TCSF	Train Control Systems Framework
TMS	Traffic Management System
TPWS	Train Protection and Warning Systems
[redacted]	[redacted]

[redacted]

A [redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

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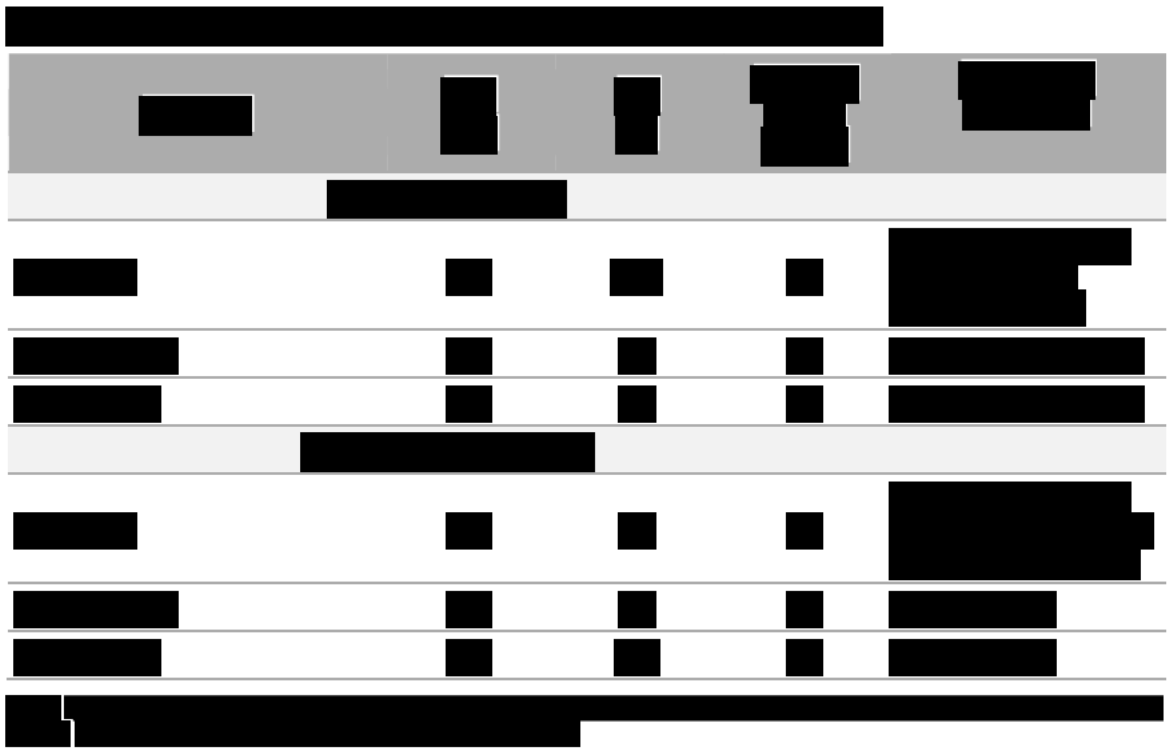

[redacted]

[redacted]

[redacted]

v. [redacted]

c. [redacted]

[redacted]

[redacted]

[redacted]

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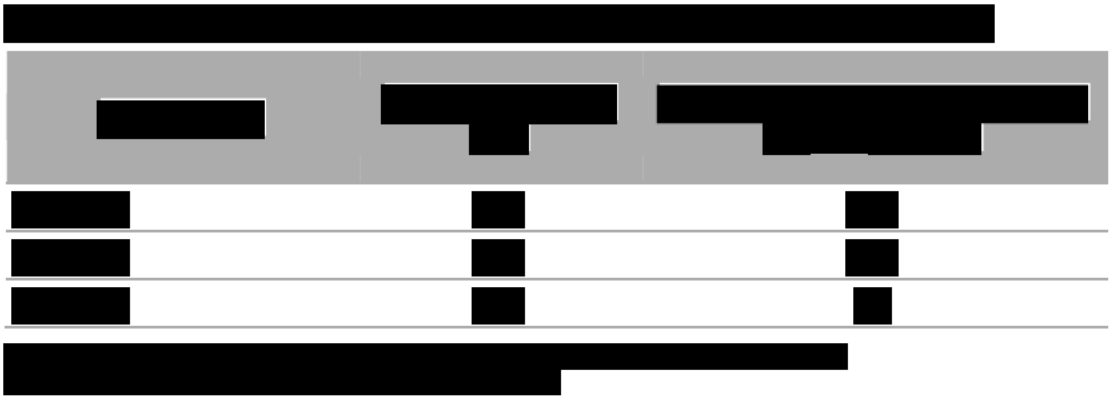

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