Our findings on system operation issues, opportunities and future challenges

Supporting document to the November 2016 consultation "Development of the regulatory settlement for the Network Rail system operator in CP6"

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Overview

Building on feedback to our June 2016 working paper 2, this document sets out our conclusions around the key issues, opportunities and future challenges we intend to focus on in developing the regulatory framework for the national system operator (NSO) business unit within Network Rail. These issues and opportunities relate to key activities undertaken by the NSO, as described in the consultation document "**Development of the regulatory settlement for the Network Rail system operator in CP6**".

We expect Network Rail to take account of the issues and opportunities we have highlighted in developing its strategic plan for the NSO for Control Period 6 (CP6), which we expect to run from 1 April 2019 to 31 March 2024. We also expect this work to inform the development of measures of the NSO's operational performance.

This document also provides an overview of the wider system operation issues and opportunities we have identified, but which we are not proposing to take forward as part of 2018 Periodic Review (PR18) and the regulatory settlement for the NSO.

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Introduction

1. System operation, and the way it is delivered, is important in securing the benefits of the rail network for passengers, freight users and funders. It is crucial that system operation is effective, informed by best available information and data, and is responsive to customer needs.

2. This supporting document sets out our conclusions on the material issues and opportunities with the way system operation is currently undertaken in rail. We are publishing this document alongside our consultation "Development of the regulatory settlement for the Network Rail system operator in CP6" (*'the November 2016 NSO regulatory settlement consultation'*).[1] Our decisions on the regulation of system operation will be informed by the issues, opportunities and future challenges set out in this document.

3. This document builds on extensive stakeholder engagement and a series of earlier publications, including:

   ■ In August 2015 we consulted on our definition of what system operation is, and what the outcomes of good system operation are;[2]

   ■ In June 2016 we published working paper 2, setting out our initial views on potential issues and opportunities with system operation.[3] This covered both activities that Network Rail undertakes (e.g. timetabling, sale of access rights, long term planning etc.), and those undertaken by other industry parties such as funders, franchising authorities and the ORR. The full list of issues we identified is available in working paper 2 (table 3.1); and

   ■ In June 2016 we also published working paper 3, setting out our initial views on the regulatory framework for Network Rail's NSO business unit.[4]

4. We will also shortly be publishing our draft guidance on Network Rail's Strategic Business Plan (SBP) for CP6, setting out our expectations for its route-level and system operator strategic plans. We expect Network Rail to consider the key issues and opportunities we have identified in this document in developing its NSO strategic plan and to identify options for improving outcomes in these areas over the next control period (for example in terms of timetabling).

5. Network Rail is currently undertaking a programme called *'SO: Fit for the Future'* to review the way that its system operation activities are delivered, and to set out its

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[1] This consultation is available here.

[2] Our August 2015 consultation, "System operation – a consultation on making better use of the rail network" is available here.

[3] Our June 2016 working paper 2 is available here.

[4] Our June 2016 working paper 3 is available here.

vision for the NSO going forward. This programme could impact Network Rail's development of a strategic plan for the NSO and, to some extent, the shape and functions of the NSO.

6. This document is structured in two main sections:

    ■   We conclude on issues and opportunities relating to the NSO's activities that we have identified as material and intend to focus on for CP6; and

    ■   We set out our findings around wider system operation issues and opportunities we have identified, relating mainly to system operation undertaken outside of Network Rail. We do not intend to take these issues forward as part of PR18 through the NSO regulatory framework.

1. Prioritised NSO issues and opportunities and future challenges

Summary

This chapter focuses on the issues and opportunities we have identified in relation to the NSO's activities, building on our engagement with industry and Network Rail to date.

We describe the issues we have identified as material and intend to prioritise as part of the PR18 regulatory framework for the NSO. These issues relate primarily to the NSO's management of capacity in the medium-term.

The issues we have identified likely reflect the fact that Network Rail's incentives are not currently balanced in a way that encourages it to make the right trade-offs between cost, performance and use of capacity. Additionally, the NSO's technical capability could be improved in terms of capacity analysis, timetabling and performance modelling, all key system operation activities.

We have also set out our views on the areas where challenges might arise for the NSO in the future. These relate to short-term functions and long-term network planning, and could be affected by on-going industry or wider market developments.

We note the NSO's on-going work which is intended to address many of these issues and challenges, and expect our findings to inform the NSO's forthcoming strategic plan.

Introduction

1.1 The issues, opportunities and future challenges we discuss in this chapter relate to the functions currently undertaken by the NSO, as set out in chapter 1 of the November 2016 NSO regulatory settlement consultation. This includes activities such as long term planning, timetabling, sale of access rights and managing the Timetable Planning Rules (TPRs).

1.2 The issues and opportunities we have identified in this chapter will inform our regulatory approach for the NSO in CP6. In addition, we expect Network Rail to consider the key issues and opportunities we have identified in this document in developing its NSO strategic plan and to identify options for improving outcomes in these areas over the next control period.

1.3 In order to identify the key areas to address in PR18, we have reviewed evidence provided by stakeholders, with responses to working paper 2 being a key input.[5] Our work has also benefitted from discussions at the Rail Delivery Group (RDG) working group meetings and our bilateral engagements with stakeholders.

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[5] Our approach to defining the key areas started with the list of issues and opportunities set out in Table 3.1 of working paper 2 relating to aspects of medium and long-term system operation.

1.4 The rest of this chapter covers:

- Our findings on the prioritised issues for the NSO regulatory settlement; and

- Our findings on the future challenges that may arise in terms of Network Rail's short-term and longer-term system operation activities.

Prioritised issues and opportunities relating to the NSO's functions

1.5 We have identified four issues to prioritise in relation to the NSO's activities, which we will seek to address as part of the NSO's regulatory framework for CP6:

(a) The incentives the NSO faces when trading-off increased capacity use, performance and cost are not currently balanced. This is partly due to the fact that there are currently no accurate measures of available network capacity;

(b) The NSO's activity of managing the TPRs and producing capacity studies to inform investment and capacity allocation decisions (by funders or ORR) could be improved;

(c) The NSO's production of the working timetable could be more effective at unlocking benefits (both in terms of capacity use and performance); and

(d) The alignment of incentives between the NSO, Network Rail (in general) and operators in relation to operational performance could be improved. While this is not an NSO specific issue, to the extent that the NSO is responsible for managing trade-offs as described above, this is also relevant for the design of our regulatory framework for the NSO.

1.6 We set out below our reasoning for prioritising these issues, organised against each of the NSO's functions.

Trade-offs and capacity measurement

1.7 In our June 2016 working paper 2 we identified a potential issue around the NSO's incentives when making trade-offs between increased network use and performance. This issue arises because only a small proportion of Network Rail's income varies with traffic (around 16%), which does not translate into strong financial incentives to find additional capacity and grow traffic.

1.8 Further, in the absence of any mitigating measures, on some parts of the network performance can be expected to deteriorate as more traffic comes onto the network. Network Rail faces strong reputational incentives in terms of network performance (e.g. punctuality of services) which, given the public sector nature of the company, may be more significant than the financial incentives it faces.

1.9   Stakeholders acknowledged that there are trade-offs to be made by Network Rail. These trade-offs can be complex due to the existence of very different, and sometimes conflicting, demand patterns. Several respondents stated that they do not think that Network Rail is reaching the best balance between the different goals at the moment.[6] This issue has also come up as part of ORR's access decisions.[7]

1.10   One contributory factor may be the lack of accurate measures of available network capacity. This also means that output metrics or incentives in relation to capacity use cannot be set at the moment, arguably affecting the NSO's incentives when making decisions around selling additional access. It may also be impacting on the NSO's role in long-term network planning, making it harder to understand where there are opportunities for additional services.

1.11   Furthermore, some stakeholders have noted that the NSO does not currently have a good understanding of the impact on operational performance of higher levels of capacity utilisation.

1.12   Consultation responses have emphasised the need for the NSO to have a consistent way of measuring capacity and a more detailed understanding of network capability. This point has also been raised in the context of RDG discussions, and in ORR's recent open access decision on the East Coast Main Line (ECML).

1.13   Network Rail currently has a measure called the Capacity Utilisation Index (CUI) which is used in the calculation of one of its track access charges. However, this is a measure of throughput (i.e. how much traffic there is on the network) rather than of available capacity. It is therefore not immediately useful for understanding what opportunities there are to run more services, and what the impact of those services on other system measures (e.g. Public Performance Measure or PPM) would be.

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[6] For example, Go-Ahead referred to the 110mph service on West Coast Main Line (WCML) introduced in 2012, which Network Rail did not initially support (due to perceived performance risk). According to Go-Ahead, this was an "unbalanced" assessment of relative gains and losses in terms of performance and capacity. Go-Ahead also described how London Midland's performance following delay incidents on WCML improved after the December 2014 timetable change, even though it had increased the number of services operating on the route.

[7] In November 2015, Arriva Trains Wales submitted an application to the ORR to extend off-peak services from North Wales / Chester to Manchester Airport. Network Rail did not support the application, on the grounds that the proposed increase in services presented a disproportionate level of increased risk to the performance of the network compared to the likely benefit that would be realised by passengers. Having reviewed the representations made by Network Rail and other stakeholders, the ORR concluded that the proposed services did not introduce a significant risk to performance such that we should reject the application. Our decision letter is available here.

Box 1.1: TRL work on options for capacity measures / metrics

In 2016 we commissioned consultants TRL to look at potential capacity metrics, based on the four definitions of capacity set out in our August 2015 system operation consultation.[8] The aim of this work was to find a set of measures that could provide a means of tracking changes in the level of network capacity provided by Network Rail and used by operators. The measures could also provide a basis for incentivising Network Rail to sell additional capacity and to balance capacity use and performance. TRL has engaged with industry, including Network Rail, in developing its analysis.

The key messages of the report are that metrics could be developed to measure the notional maximum capacity of parts of the network ("Notional Capacity") and how much capacity is currently used by rail services ("Capacity in Use") based on existing industry systems, data and methodologies. The analysis was not able to produce robust and scalable metrics for the "Plannable Capacity" measures from the ORR's specification (and the "Throughput" metric was out of scope).

We believe that with further work these metrics could be used in CP6 to support transparency and monitoring. However, these metrics could not be immediately developed into regulated outputs, due to the need to test their robustness.

Determining capacity from the physical network

1.14   This refers to the NSO's activity managing the TPRs which underpin timetable production and its production of capacity studies on an ad hoc basis. These inform decisions around allocation of capacity (by ORR) or changes to the network.

1.15   Several respondents highlighted that the TPRs are not based on the most up-to-date inputs and assumptions. For instance, Go-Ahead stated that Network Rail uses out-dated Permanent Speed Restrictions and inaccurate Sectional Running Times (particularly information on operational platforms lengths). MTR Crossrail provided examples of other parameters that need to be updated (dwell times, junction margins). Freightliner gave the example of a line which has "*substantial amount of unnecessary pathing time in its schedule which both reduces its average speed and degrades capacity over [it]*".

1.16   Network Rail has put in place a programme to update the TPRs with input from industry. This work could improve understanding around how much capacity there is

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[8] These definitions were: notional capacity, plannable capacity, capacity in use and throughput. The full definitions are available in TRL's report "Options for capacity measures / metrics" which will be published later this year and will be available here.

available on the network, as well as delivering improvements in performance. We believe this programme is an important aspect of the NSO's role going forward.

Box 1.2: Network Rail's Timetable Rules Improvement Programme (TRIP)

In Control Period 5 (CP5) Network Rail put in place a Timetable Rules Improvement Programme (TRIP) which models train movements to better inform TPR values and generate greater visibility of the true capacity of the network. These outputs provide evidence to support the decisions Network Rail makes and ultimately improve performance. To date, TRIP has delivered nearly 1,500 improved TPRs – aiming to deliver a 0.46 percentage points PPM improvement by the end of CP5. The programme has worked across all 8 routes analysing over 5,000 track miles, involving more than 40 cross-industry collaborative forums.

1.17 Additionally, following the work undertaken by Network Rail in terms of capacity analysis for the recent ECML access applications, we have identified areas where Network Rail, and therefore the NSO, could improve its analysis. Better analysis could inform our capacity allocation decisions (as well as wider decisions, for example by franchising authorities in terms of service design). We have asked Network Rail to think about possible improvements in this area, and we think this will be relevant to our regulation of the NSO.

Producing the working timetable

1.18 This area of activity covers a number of the issues identified in working paper 2 relating to the quality of timetabling and the current incremental approach to timetabling. It also refers to the fact that incentives may currently be lacking for the NSO (and others) to develop the data and systems required significantly to improve timetabling.

1.19 A number of respondents agreed that the current approach to timetabling may be overly focused on delivering existing timetables and service patterns.[9] Respondents also agreed that timetabling is generally an incremental exercise, as opposed to considering timetable changes from a holistic perspective. The Department for

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[9] Transport Scotland noted that they were *"interested in the opportunities that may arise from exploring a more radical approach to timetable recasts and reconfiguration where required to safely unlock additional capacity as a cost-effective alternative to other interventions and we would welcome further investigation of this area"*.

Freightliner also emphasised that *"it is important that the system operator considers the timetable holistically and fully understands the implications of different service options in order to ensure that on a capacity constrained network, the pattern of services that offers the highest socio-economic value is delivered."*

Transport also highlighted that *"while not strictly an issue for CP6, the opening of HS2 will require significant changes to timetables not just on the new line but also on many parts of classic network."*

1.20 Another specific issue falling under that category is that timetables contain conflicts. MTR Crossrail referred to the need for greater conflict detection. In 2016, the proportion of delay minutes caused by planning errors was up 2.4% compared to the previous year.

1.21 Respondents have also suggested potential way of improving timetabling going forward. MTR Crossrail wrote that *"timetabling needs to be more automated (i.e. conflict detection and greater visibility of possessions, ability to quickly simulate a timetable change)"*.

Box 1.3: Network Rail's Capacity Planning Improvement Programme (CPIP)

CPIP is a programme aimed at improving Network Rail's ability to deliver the timetable. It focuses on developing the staff capability, processes and technology and aims to enhance the efficiency and effectiveness of timetabling.

Some of the key projects include: moving toward paperless publications and supplying electronic information to all customers; developing a competency development framework for Capacity Planning staff and a set of performance assessment criteria; creating a clear progression pathway and support system for new planners; embedding a culture of continuous improvement across the function; and creating a model office to test and develop ways of ensuring conflict-free timetables.

Network Rail estimates that the programme has delivered £218k in avoided Schedule 8 costs, achieved through a project focused on signal box opening hours. It estimates that the move towards becoming paperless has saved an additional £250k.

The Operational Planning Assistant scheme has worked with 10 different operators, with 44 Operational Planning Assistants entering the scheme and a further 20 entrants starting shortly. Network Rail estimates that the scheme has reduced the average time for a planner to be deemed competent by 40%.

Performance analysis

1.22 Network Rail and operators may have different punctuality and performance targets and therefore different incentives when it comes to delivering performance. Respondents stated that industry incentives are misaligned in terms of delivering performance. For example, Network Rail described that in Scotland the franchise

agreement has different requirements to those set for Network Rail. Another example is the case of Chiltern, who has higher PPM targets than Network Rail.

1.23 Additionally, the current ways of measuring performance – i.e. the use of the PPM and Cancellations and Significant Lateness (CaSL) metrics – might not be driving the right behaviours in terms of designing robust timetables that reflect the impact of disruption on passengers. As highlighted in our July 2016 working paper 4 on the outputs framework[10], the reasons why PPM and CaSL might not be driving the right behaviours include:

- They are train measures, not passenger measures (i.e. each train has equal weighting, regardless of the number of passengers);

- They are pass/fail measures per train at five and ten minute thresholds and measured at final destination only; and

- They are shared responsibility measures – Network Rail and train operators share responsibility for delivering PPM and CaSL which can result in confused accountability.

1.24 For these reason, we are supporting improvement to how performance is measured (see box 1.4).

Box 1.4: Development of a new measure of punctuality

In 2015, the National Task Force (NTF), a group drawn from across industry (including Network Rail, RDG and operators), began a work stream to consider potential alternatives to the current punctuality measures: PPM and CaSL.

While used by the industry as a focal point for performance improvement for 15 years, PPM has a number of drawbacks. The NTF has developed a suite of alternative measures that might be used by the industry, including: total passenger lateness, train punctuality at station stops, cancellations, number of severely disrupted days, etc.

The industry is still finalising the definitions of these measures and assessing implementation issues. Such measures could increase Network Rail's focus on impacts on passengers, as well as providing better alignment between Network Rail and operators in terms of performance targets.

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[10] Our July 2016 working paper 4 on the outputs framework is available here.

Potential future challenges for the NSO

1.25 There are also a number of areas where challenges might arise for the NSO going forward (i.e. in CP6 and beyond).

A. Impact of route-level devolution on short- to near-term system operation

1.26 As highlighted in working paper 2, our work to date has not identified significant or systematic issues in relation to how Network Rail currently undertakes its very short-term system operation activities, most of which are delivered at the route level.[11] However, with increased devolution of responsibilities by Network Rail to its route business units in CP6, we need to continue to monitor the way that short- to near-term system operation activities are delivered at the route level. This is in order to ensure the NSO continues to provide coordination where it is needed (for example when incidents happened that affect services on more than one route), and users are safeguarded against discrimination.

1.27 In a more devolved system, the NSO needs to focus on managing system-wide outcomes (in terms of capacity, performance and safety) for all users (e.g. including freight and national operators). For example, it will be important to ensure that incident management continues to provide a coherent response at times of disruption that takes account of what is happening on the other routes.

1.28 Very short term requests for capacity are also assessed at the route level. Where they have implications for services that cross route boundaries, it will be important for the NSO to continue to provide a coordinating function that seeks to maximise benefits from use of the whole network.

Long-term network planning: the changing NSO's role in developing proposals for changes to the network

1.29 The NSO undertakes an important role in respect of long-term planning, including by:

■ providing analysis to support decision-making on necessary network investment;

■ managing the interaction between enhancements and the existing network (including possibly the coordination of enhancement delivery with operation, maintenance and renewal work banks); and

■ ensuring that (Network Rail) enhancement projects deliver improved capability in practice (including whether the outcomes funders sought are delivered).

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[11] Freight operators have notes some issues around very short term planning (VSTP) and validation of paths.

1.30 This role will become increasingly important and complex as the number and range of funders (e.g. local authorities, operators etc.) grows. More generally, working paper 2 raised a number of additional issues and opportunities relating to long-term system operation. These are being considered as part of the on-going work on the process for enhancements in CP6[12].

1.31 Working paper 2 consultation respondents echoed these potential future challenges by expressing some frustration with the way Network Rail consider their specific needs, which might prove even more challenging in the context of route-devolution[13]. Some respondents have attributed some of these issues to a lack of capability, which may exacerbate other issues if not addressed.

1.32 Network Rail (and the NSO) is already seeking to address these future challenges as part of its *'SO: Fit for the Future'* programme. ORR will, in particular, be monitoring Network Rail's progress on the following points:

■ How the NSO supports the appropriate use of the national network in the longer term. This includes informing ORR's decisions about how use of the network should be allocated to different users and helping to inform the rest of Network Rail and wider industry about potential operational efficiencies; and

■ How the NSO supports franchising authorities' decisions, including by providing timely and useful information.

Next steps

1.33 The issues and opportunities we have identified in this chapter will inform our regulatory approach for the NSO in CP6.

1.34 In addition, we expect Network Rail to consider the key issues and opportunities we have identified in this document in developing its NSO strategic plan and to identify options for improving outcomes in these areas over the next control period.

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[12] We have already started looking with industry at options for the treatment of enhancements in PR18 though our August 2016 working paper 5 available here.

[13] This is reflected in stakeholder feedback to Issue 2A and 2E ("Parties involved in developing proposals for changes to the network take decisions over different time frames" and "Network Rail does not face significant revenue risk if projects do not deliver the improvements assumed").

2. Issues and opportunities relating to system operation activities outside of Network Rail

2.1 Some of the issues we identified in working paper 2 relate to wider rail industry processes and arrangements (including contractual relationships) undertaken by funders, operators and ORR, rather than principally relating to system operation activities undertaken by Network Rail.

Analysis of changes to the network

2.2 The issue that respondents mentioned most frequently was that decisions around changes to the network need to reflect a wider range of benefits than they currently do. Freight operators in particular thought this was an important issue. The track access charges freight operators pay to Network Rail only cover short-run variable costs (with a few exceptions of commodities which contribute towards fixed costs). However, the contribution of freight to the economy, in terms of increasing GDP and the impact on the environment, is substantial. One response suggested that the productivity gains for British businesses in terms of congestion and wider environmental benefits are over £1.6bn per annum. Reflecting this, responses stressed the need for cost benefit analysis to take into account the wider benefits.

Time-limited nature of franchises

2.3 Many stakeholders said that the time-limited nature of passenger franchises encourages franchisees to make their proposed timetable changes and investment in rolling stock and facilities as early as possible in the franchise term, to maximise their returns on investment. There can then be a lengthy period with little or no development before the next franchisee takes over. The incentives for franchisees are to maximise profits while meeting the terms of the franchise contract, so the focus in later years tends to be on minimising costs (which can be delivered with reasonable certainty in the short term) rather than initiatives which could (but might not) grow revenue.

2.4 Other issues around the design of franchises include the fact that franchise contracts are focussed upon the delivery of specific outputs for a determined revenue/cost , with little incentive to improve use of capacity on the network. Franchise contracts are not standardised and they – perhaps inevitably – reflect what the franchising authority saw as the key principles, priorities and concerns at the time they were let.

Specification of enhancements

2.5 Another wider issue is that it is difficult for funders to specify enhancements in detail, well ahead of delivery. As a result of this, it is equally difficult for Network Rail to

provide costs and programme estimates with certainty if the scope to deliver the outputs is so flexible and subject to change.

Next steps

2.6 We cannot directly affect the above issues through how we regulate the NSO, or Network Rail more generally. For example, franchise agreements are inevitably time-limited, and franchising authorities will seek to mitigate these adverse impacts in the way they structure their franchises.

2.7 However, improvements could be secured over time through our general approach to regulation of the NSO, as a stronger focus on the NSO's capability in terms of capacity measurement and economic assessment of capacity will tend to support improvements across the board. We will consider this as we develop the regulatory settlement for the NSO.